



PHD

An exploration of standardised processes in a knowledge-intensive healthcare operation: Implementing the acute stroke care 'pathway'

Frangeskou, Marianna

Award date:
2018

Awarding institution:
University of Bath

[Link to publication](#)

Alternative formats

If you require this document in an alternative format, please contact:
openaccess@bath.ac.uk

Copyright of this thesis rests with the author. Access is subject to the above licence, if given. If no licence is specified above, original content in this thesis is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC-ND 4.0) Licence (<https://creativecommons.org/licenses/by-nc-nd/4.0/>). Any third-party copyright material present remains the property of its respective owner(s) and is licensed under its existing terms.

Take down policy

If you consider content within Bath's Research Portal to be in breach of UK law, please contact: openaccess@bath.ac.uk with the details. Your claim will be investigated and, where appropriate, the item will be removed from public view as soon as possible.

An exploration of standardised processes in a knowledge-intensive healthcare operation: Implementing the acute stroke care ‘pathway’

Marianna Frangeskou

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

School of Management

October 2017

COPYRIGHT

Attention is drawn to the fact that copyright of this thesis rests with the author. A copy of this thesis has been supplied on condition that anyone who consults it is understood to recognise that its copyright rests with the author and that they must not copy it or use material from it except as permitted by law or with the consent of the author.

This thesis may be made available for consultation within the University Library and may be photocopied or lent to other libraries for the purposes of consultation with effect from(date)

Signed on behalf of the School of Management.....

Acknowledgments

Do guardian angels exist? I am sure that we all have thought of or asked other people this question. The answer we usually get is based on personal religious beliefs or life experiences.

There are many people who have walked alongside me over the past three and a half years. Without the love of these people towards me as a person and to my work, this thesis would never have happened. Acknowledging and thanking these people for all of their support, I would firstly like to thank my two supervisors, Professors Michael Lewis and Christos Vasilakis.

Mike, if it was not for you I would never have been able to finish this project. You made this journey, towards my PhD, so interesting and much easier than it could have been. You have been supportive, helping me get back up whenever I fell, whenever I was losing my passion and confidence for my work. You inspired me with new ideas and kept challenging me until you could get the best out of me. You were always so willing to have a chat, wherever in the world you happened to be - I never felt you were absent, even if you were rarely physically at your office. Mike, it is hard to express in words how much I appreciate every moment I worked with you, how much I admire you for who you are - both an impressive academic and a beautiful person, and how much I THANK YOU for all you have done for me all this time. I just feel very lucky for having you as my supervisor.

Christo, you have been both an excellent supervisor, and a PhD father to me. You were always there and willing to listen to my worries, and find ways to support me both financially and emotionally when I needed you to. Your faith in me and my project was very important for keeping me going. I would also like to THANK YOU for everything, and I greatly appreciate everything that you have done for me. It has been a pleasure working with you.

This PhD would not be possible without the cooperation of the Royal United Hospital of Bath ("RUH") - both financially supporting me and providing me with access to its facilities - and the medical staff who trusted in me and allowed me to work with them for more than a year. During the year I worked in the RUH, I used to tell my mother and friends: "I love the hospital. I am looking forward to going there every day." and they used to reply: "Are you crazy? People usually hate hospitals, except for the medical staff." Maybe they were right, but what they did not know is with what great people I was working with. Such great people like Monica Baird and Marc Tooley, my two Hospital partners, whom I would like to personally thank. Although you are not staff of the RUH anymore, Monica and Marc, you were walking beside me through this journey. It is also important to thank all the staff of the Acute Stroke Unit (ASU) at the RUH, who also welcomed and supported me, through and

after the data collection period for my study. Thank you all, I just feel lucky that I had the opportunity to meet and work with you. You made this experience amazing for me.

Many thanks also to all my friends and colleagues in the IDO Division of the School of Management at the University of Bath. You have all been very supportive of me for all these years and it was great to feel that I had everyone next to me when I needed it. Barish Yalabik, I would like to personally thank you. You have been both a great friend and colleague.

The people in the office; the marketing group as I used to call them, were also a bright ray of sunshine during my office days. I will never forget the numerous lunches we used to have together and how much I loved talking to all of you about anything but research. Thank you, guys, it has been great meeting you all. Paul ‘Pinkey’, as I used to call you, THANK YOU. No need to say more, you know how much I appreciate your friendship.

It would be a shame not to say a big THANK YOU to my friend Rodoula Gregoriou. Rodoula, you have been a great friend to me during these difficult years. It would be impossible for me to be where I am right now if it were not for you listening and meeting me whenever I needed it. You are a great friend and honestly, you have contributed to this work so much, more than you know you have: “Ευχαριστώ για όλα φίλη μου”!

Nima and Ray, a big thank you to you as well. Having real PhD friends supporting you academically and emotionally, with so much love, understanding and empathy, is so important. I was very lucky to have you alongside me all these years.

Moreover, I would like to say A BIG THANK YOU to Fr. Michael English and Dr. Marios Smyrnios. Father, you know well how much I love you, how much you have supported me and mean to me. I loved every moment I spent with you. You taught me how to handle my thoughts well and how to keep going every time I felt lost and when I could not bear this work anymore. My Kirie Marie, your help was priceless. It is good to know that people like you exist among us and thank you for walking with me till the end: “Ευχαριστώ”!

Finally, I want to dedicate this thesis to each member of my precious family; my two parents, sisters and brother. Guys, I would never have been able to finish this PhD without your support and love. You are not only my family, but my best friends as well. You all kept reassuring me that I am capable of finishing this work, and reminding me how much you love me and are always beside me. Mum, there are simply no words to express my gratitude to you; you will never stop impressing and reminding me that a Mother’s love can do wonders. THANK YOU. Dad, thank you for always supporting my decisions, being so proud for me, and for hugging me every time I needed it. Josef, Antonia and Marina thank you for listening to me every time I called you crying, complaining and worrying. Thank you for

coming to visit me every time I was not well, from wherever you were, just to remind me that I am not alone and that you are all walking alongside me during this PhD journey and the journey that is life.

In conclusion, guardian angels do exist, at least in my humble opinion. I always used to believe that, but these last few years my beliefs have become even stronger. Each one of these people I named above, and many others who were there but were not named, were my PhD guardian angels. Some of them will keep walking beside me in the years to come, others may not. But each of them was there when I needed them, helping me fulfil my dreams. I was never alone, each one of them was there to guide, help, and support me in their own way. Thank you all. It has been a pleasure walking this journey with you beside me.

Abbreviations list

Hospital Departments	
ED	Emergency Department
ASU	Acute Stroke Unit
RD	Radiology Department
Participants	
SN	Stroke Nurse
EDA	Emergency Department Assistant
SNP	Stroke Nurse Practitioner
SD	Stroke Doctor
HCA	Healthcare Assistant
SR	Senior Radiologist
Literature Review Concepts	
QI	Quality Improvement
OM	Operations Management
HOM	Healthcare Operations Management
ORs	Organisational Routines
IPO model	Input Process Output model

Abstract

A widely used mechanism for improving the efficiency and effectiveness of healthcare is the introduction of the clinical care pathway (i.e. an OM-type process initiative summarising the optimal sequencing and timing of care for different types of patient). Research to date suggests variable levels of success for these improvement initiatives and, consequently, the research reported in this thesis sought to answer two framing research questions: (1) What, if any, are the distinctive characteristics of standard professional/judgement (healthcare) work, and (2) What are the challenges associated with implementation of standard work in a professional (healthcare) operations setting? The work draws on, and develops, concepts and insights from (healthcare) operations management and organisational routines. The research design takes the form of a single in-depth case study of the adoption of a stroke care pathway in a UK hospital, but various methods were used to triangulate the source material (e.g. multiple interviews, extensive non-participant observation, analysis of archival documents, performance data, etc.). The research suggests three areas where there is novel (OM) insight and specific implications for both healthcare practitioners/policy makers.

Firstly, the stroke care pathway was a UK national (i.e. top-down) initiative requiring local implementation. This setting highlighted a specific gap in the traditional process logic. The pathway took flow dependency as its design logic but failed to recognise that a single treatment pathway would also be subject to other forms of dependency that would, in turn, undermine the adoption process. Specifically, informal competition between pathways for particular resources such as scanning created resource-sharing dependencies. Similarly, integration with other extant formal and informal care pathways, manifest in hospital KPIs, flow charts (and other artefacts) diagnostic disputes and the basic geography of the Hospital created fit/portfolio alignment dependencies. For theory, stressing the need for a multi-faceted/level notion of process is a key insight and for practice, these dimensions represent a useful extension for future pathway design.

Secondly, building on key insights from the routines literature, pathway artefacts (diagrams, instruction manuals, software, etc.) can offer a critical insight into a key challenge for ‘standard’ (and the standardising of) professional work: individual autonomy. Autonomy with respect to specific (care) judgements is arguably the characteristic of such knowledge work but it inevitably leads to differential interpretation (diagnoses, models of care), negotiations and consequential “turf wars”. Artefacts can be a significant visual/physical manifestation of these ‘zones of autonomy’. It is equally important to note that the accuracy

and representation of artefacts may have an effect on how practitioners perceive and process information, which subsequently is used to perform the work. For theory, OM scholars need to move beyond a normative (this is the flow, etc.) view on process artefacts (e.g. process maps simplistically labelled ‘as is’ and ‘to be’) and for practice, developing a more interactive and collaborative approach to the creation of these artefacts may add significant value to the design/implementation process.

Thirdly, the notion of continuous improvement needs to be revisited in professional/knowledge-intensive work settings. Specifically, mechanisms for knowledge sharing between (professional) individuals need to be more fully considered. Some of this relates to the above conclusions, fuller characterising of the pathway, active consideration of professional autonomy (and use of artefacts to help understand and improve the inevitable ‘design as negotiation’ process) but the research also highlights the significance of investing in support of relational resources between healthcare practitioners. Some of this builds on ‘typical’ OM logic, co-locating spaces, time to communicate, support (S&OP type) infrastructure, etc. which, can, ironically be overlooked because of the very autonomy described above.

Contents

1 Introduction 16

<i>1.1 Background and motivation for the study</i>	16
<i>1.2 Research aim and objectives</i>	18
<i>1.3 Significance of the study</i>	20
<i>1.4 Outline of the thesis</i>	22
1.4.1 Chapter 2: Literature Review	22
1.4.2 Chapter 3: Methodology	22
1.4.3 Chapter 4: The case study	23
1.4.4 Chapter 5: Discussion	23
1.4.5 Chapter 6: Conclusions	24

2 Literature Review 25

<i>2.1 Healthcare Operations Management (HOM)</i>	28
2.1.1 Operations management (OM)	28
2.1.2 Process orientation in the hospitals	31
2.1.3 Systemic perspective of process management	34
<i>2.2 Organisational routines (ORs)</i>	37
2.2.1 Routines as generative systems	39
<i>2.3 Insights from the Healthcare Operations Management literature</i>	41
2.3.1 Variable work processes and outcomes	43
2.3.2 Professional inputs	43
2.3.3 Resource management	47
<i>2.4 Insights from the ORs literature</i>	50
2.4.1 Interpersonal relationships	52
2.4.2 Interaction between the professionals and organisation	58
2.4.3 Broader environmental factors	64

2.5	<i>Towards a conceptual framework</i>	65
2.6	<i>Conclusion</i>	68
3	Methodology	72
3.1	<i>Research Paradigm</i>	72
3.1.1	Positivism	74
3.1.2	Interpretivism	74
3.1.3	Critical realism	75
3.1.4	Philosophical choices for this study	76
3.2	<i>Research approach</i>	76
3.2.1	Research strategy	77
3.3	<i>Case study selection</i>	79
3.3.1	Access in the field	80
3.3.2	Data collection methods	81
3.3.3	Data analysis	90
3.4	<i>Reliability and Validity of the data</i>	94
3.4.1	Validity and variability of the primary and secondary observations	95
3.5	<i>Summary</i>	97
4	The case study	98
	<i>Stroke at the Hospital of study</i>	100
4.1	<i>Pre-arrival stage</i>	104
4.1.1	Variations of the patient pre-arrival stage	106
4.2	<i>The patients' ED admission stage</i>	113
4.2.1	Variations of the patients' ED admission stage	115
4.3	<i>Brain imaging stage</i>	124
4.3.1	Variations of the Brain imaging stage	125
4.4	<i>The patients' ED medical assessment and decision-making stage</i>	130

4.4.1	Variations of the patients' clerking and decision-making stage	131
4.5	<i>The patients' admission in ASU stage</i>	148
4.5.1	Variation of patients' admission to ASU stage	150
4.6	<i>Summary</i>	154
5	Discussion	156
5.1	<i>What, if any, are the distinctive characteristics of standard professional/judgement (healthcare) work?</i>	157
5.1.1	Formalisation of the pathway processes	157
5.1.2	Fragmentation of capacity (Shared resources)	171
5.1.3	Conflicting Key Performance Indicators (KPIs)	180
5.1.4	Summary	186
5.2	<i>What are the challenges associated with implementation of standard work in a professional (healthcare) operations setting?</i>	187
5.2.1	Incongruence of mental model of care	188
5.2.2	Hierarchical structure	191
5.2.3	Co-location and physical interaction	193
5.2.4	Summary	198
6	Conclusions	202
6.1.	<i>Care Pathways have multiple dependency dimensions (i.e. not just flow)</i>	203
6.1.1	The care pathway is flow and path dependency	203
6.1.2	The care pathway is also a resource sharing dependency	205
6.1.3	The pathway is also a fit dependency	207
6.1.4	Towards a pragmatic process model	208
6.2	<i>Reconsidering the role of healthcare professionals in HOM</i>	212
6.2.1	Knowledge intensive/professional continuous improvement	213
6.2.2	The critical role of (process) artefacts	215
6.2.3	Towards a framework for professional/knowledge work-centric	217
6.3	<i>Future Work</i>	221
7	References	223

8 Appendix 253

<i>A. Literature Review</i>	253
<i>B. The case study</i>	257
<i>C. Methodology</i>	258
<i>D. Discussion</i>	211

List of Tables

Table 2.1: Search method of Literature Review	27
Table 3.1: Features of the main paradigms in management research	74
Table 3.2: Research Strategies	78
Table 3.3: Interviews conducted during the field study	85
Table 3.4: Number of instances for each stage of the acute stroke care pathway, directly observed and from data collected from interviewing staff.....	88
Table 3.5: Time in the field (March 2015-January 2016).....	89
Table 3.6: Areas of Observation and roles within each area.....	89
Table 3.7: Brief descriptive analysis of secondary data.....	94
Table 3.8: Sample of comparison made between the primary and secondary observation data	96
Table 4.1: A brief interpretation of the function of each symbol used in the flow charts ..	101
Table 4.2: Descriptive data of both, secondary and stroke patient datasets.....	104
Table 4.3: Descriptive data of both, secondary and primary stroke patient datasets	105
Table 4.4: Descriptions of variations observed in patients' pre-arrival stage.....	112
Table 4.5: Relationship between the competence of ED consultant on stroke care and timeliness of initial assessment	120
Table 4.6: Description of variations observed in the patients' ED admission stage	123
Table 4.7: Description of variations observed in the patients' brain imaging stage.....	129
Table 4.8: Relationship between the interest/specialism of ED senior doctor in stroke care and timeliness of decision-making	142.
Table 4.10: Description of variations observed in patients' medical assessment and decision-making stage.....	147
Table 4.11: Description of variations observed in patients' admission to ASU stage	153
Table 4.12: Summary of variations in the stroke care pathway and attributable factors ...	155
Table 5.1: Summary of pathway formalisation elements and their impact on its performance	170
Table 5.2: Pathway staff scheduling in the Hospital.....	174
Table 5.3: Stroke doctor scheduling on 3 consecutive weeks.....	176
Table 5.4: Summary of the key findings explaining the variation of stroke care pathway	201
Table 6.1: Key pathway dependencies and suggestions regarding their management	211
Table 6.2: Key elements of professional work and suggestions regarding their management	219

Table 7.1: Overview of literatures on factors that influence operations process management initiatives found in healthcare settings in OM & ORs literatures	256
Table 7.2: Analysis of the stages observed in each pathway instance	201
Table 7.3: Coding Scheme Used for the analysis of the data.....	210

List of Figures

Figure 2.1: All operations are input-transformation-output models	30
Figure 2.2: Configuration of IPO model with main insights from HOM and ORs literature	42
Figure 2.3: Configuration of IPO model with main insights from ORs supported from HOM literature	51
Figure 2.4: Conceptual Theoretical Framework of the study – Configuration of IPO model with main insights from HOM& ORs literatures	71
Figure 3.1: Morgan’s examples of research paradigms	73
Figure 3.2: An overview of the strategy followed for the data collection process	82
Figure 4.1: Medical diagnosis of patients admitted in the Hospital with suspected stroke .	99
Figure 4.2: The official stroke care pathway at the Hospital	100
Figure 4.3: The official description of Stage 1	104
Figure 4.4: Variations of the patients' pre-arrival stage	106
Figure 4.5: Description of the official version of patients' ED admission stage.....	113
Figure 4.6: Variations of the patients' ED admission stage	115
Figure 4.7: Description of the official version of patients' brain imaging stage	124
Figure 4.8: Variations of the patients' brain imaging stage.....	125
Figure 4.9: Description of the official version of patients' ED clerking and decision-making stage.....	130
Figure 4.10: Variations of the patients' ED clerking and decision-making stage	131
Figure 4.11: Description of the official version of patients' brain imaging stage	148
Figure 4.12: Variations of the patients' admission to ASU stage.....	150
Figure 5.1: Stroke care pathway diagrams	169
Figure 5.2: Trend of stroke patient arrivals per-day	177
Figure 5.3: Evidence taken from annual SNP evaluation report.....	178
Figure 5.4: Illustration of pathway performance when non-stroke patient is prioritised...	183
Figure 6.1: Beyond a simple flow dependency logic	207
Figure 7.1: The form used by Paramedics to assess patients in the ambulance.....	257
Figure 7.2: Sample of Field Notes	199
Figure 7.3: Diagram created by SNP, October 2015	211
Figure 7.4: Diagram created by ED senior doctor, December 2015	212
Figure 7.5: Diagram created by ASU team 2013 and reviewed 2016	213
Figure 7.6: Diagram (followed by text) and text created by ED and ASU team and introduced to the RD staff to follow, December 2015	214

Figure 7.7: Diagram created by RD staff set to the ED for approval, but never approved, 2011	216
Figure 7.8: Diagram created by SNP and ED doctor, 2015	217
Figure 7.9: Diagram created by ED staff 2014	218
Figure A..8.10:	219
Figure.7.10: Acute & in-patient MRI head referral guideline	219

List of pictures

Picture 4.1: The ASU white board showing patient load.....	135
Picture 5.1: Map of the Hospital	159
Picture 5.2: Stroke care pathway process.....	163
Picture 5.3: Staffing level of stroke nurses	173

1 Introduction

The research reported in this thesis was a detailed investigation of the adoption of a quality improvement (QI) initiative in a UK Hospital; specifically, the adoption of a clinical care pathway for acute stroke diagnosis and treatment. Care pathways are interdisciplinary care plans that summarise the optimal sequencing and timing of interventions for patients with a particular diagnosis, procedure or symptom, (Ignatavicius and Hausman, 1995; Campbell *et al.*, 1998; Atwal and Caldwell, 2002). The thesis draws on, and develops, concepts and insights from both healthcare operations management (HOM) and organisational routines (ORs) theory. In this introductory chapter, a brief description of the background and motivations for the research is presented, followed by an outline of the specific research aim and objectives, the significance of the study, followed by a brief outline of the remainder of the thesis.

1.1 Background and motivation for the study

Currently healthcare systems in general, and hospitals in particular, face significant sustained pressures to improve their effectiveness - defined as timely and safe treatment, and efficiency - defined as optimal use of resources. These are of great and equal importance in improving the performance of healthcare systems (Tucker, 2007; Ponsignon, Maull and Smart, 2014). The Institute of Medicine (IOM), in their report, *To Err Is Human* (IOM, 1999) argue that most of the medical errors result from damaged systems and processes, not individuals. To realise these aims, healthcare organisations have turned their attention to the field of operations management (OM) and adopted numerous quality improvement (QI) strategies and methods used in other industries to improve their processes (i.e. manufacturing, shipping and others) (Tucker, 2007; Grove et al., 2010; Dobrzykowski et al., 2014).

Because errors result from inefficient system or process (McNally, Page and Sunderland, 1997), it is vital to adopt various process-improvement techniques to recognise inefficiencies, ineffective care, and avoidable errors to then stimulus changes related with systems (Haghues, 2008). A QI initiative is defined as “any intervention aimed at reducing the quality gap for a group of patients’ representatives of those encountered in routine practice” (McDonald *et al.*, 2007) (p. 13). These aim at making positive changes in health care processes to achieving positive outcomes (Haquhes, 2008). QI initiatives differ in their focus, targeting different type of processes, depending on the nature of QI project. Literature of business process management (BPM) (Smart, Maull and Childe, 1999, Smart *et al.*, 2009) argues that at the highest level of abstraction business processes are classified in three basic groups of ‘manage’, ‘operate’, and ‘support’. This classification, the so called CIM-OSA

standard, was advanced from some early European research on business processes (AMICE, 1989). ‘Manage’ processes deal with strategic matters (i.e. set of project goals and objectives), ‘operate’ processes are concerned with the production of services and products and emphasis is given on filling the requirements of the external customers, while ‘support’ processes assist and enable ‘operate’ processes so that can function properly (Ponsignon, 2010). To recap, value to the customer/ patient is added by the ‘operate’ processes, with the help of the ‘support’ processes and directed by the ‘manage’ processes (Ponsignon, 2010).

Thus, depending on the nature of the QI project, QI initiatives such as Lean, Six Sigma, Business Process Management (BPM) and others are strategies applied to the whole organisation, emphasising the improvement of the three different types of the business processes. While QI initiatives such as evidence based medicine, clinical care pathways and professional development target the improvement of operational processes. The core operational processes identified by Champy (1995) and Meyer (1993) are patient (customer) service, patient treatment (product development) and patient treatment completion (order fulfilment).

Adopting QI methods has been shown to improve medical outcomes such as reduced patient mortality rates (Brown, Tucker and Domokos, 2003), as well as operational outcomes such as; service delivery and workforce efficiency, increased capacity for admissions to the hospital unit, reduced waiting times for assessments and treatments and reduced lengths of stay in hospital (McDermott and Stock, 2007; Allen and Rixson, 2008).

Yet, this is not always the case. Although these OM approaches have been shown to have a positive impact in some settings, evidence suggests that the majority of these organisations fail to implement QI initiatives successfully, and thus fail to deliver the expected improvements in operational performance (Grimshaw *et al.*, 2004; Levac, Colquhoun and O’Brien, 2010; Lifvergren *et al.*, 2010). Much of the existing data and research indicates that considerable shortcomings in the delivery of effective and reliable care persist (Boyer, Gardner and Schweikhart, 2012). In comparison to other industries such as car manufacturing, shipping and aircraft manufacturing the healthcare industry has made limited gains in successful adoption of QI process-initiatives.

This has been shown to be the case, even in instances where healthcare policy-makers, practitioners and managers invest substantial time and resources in adopting and implementing hospital-based QI initiatives, with many organisations failing to integrate new practices into their work routines (Brand *et al.*, 2005; Buchanan *et al.*, 2005; Bailie *et al.*, 2006; Stirman *et al.*, 2012). Boaden *et al.* (2008, p. 17) extensively reviewed the available evidence regarding the effectiveness of several QI initiatives applied in healthcare and

concluded that “Whilst the evidence for the effectiveness of particular approaches to QI has already been considered and shown to be lacking in many cases, there are some wider studies which consider the impact of quality improvement as a generic organizational change”. Similarly, Øvretveit (1997) compared quality programs, mainly in European hospitals, and noted that “none of the hospitals could give evidence of improvements to patient care or cost reductions, or evidence of process improvements”. In more recent studies scholars have reached similar conclusions (Saint *et al.*, 2003; Van Gerven *et al.*, 2010; Peltokorpi, 2011; Deneckere *et al.*, 2012).

The significance of process improvement and the adoption of process initiatives for healthcare practitioners, contrasts with the limited theoretical advances attained in the academic literature. Ponsignon *et al.* (2014) note that there are a limited number of studies that attempt to understand the principles of implementation for the process improvement initiatives undertaken by healthcare organisations (Reijers and Liman Mansar, 2005). Particularly, they state that the successful implementation of such initiatives remains more art than science (Limam Mansar and Reijers, 2007). Thus, to obtain the benefits of process improvement initiatives in healthcare organisations –elimination of process variations to improve operational performance and medical outcomes – there is an implied need to better understand the factors challenging their adoption.

1.2 Research aim and objectives

The overarching purpose of this study is to improve the delivery of stroke care. One approach to achieve this is to investigate the challenges healthcare organisations face in adopting QI approaches such as acute stroke clinical care pathway aimed at improving stroke care operational processes. Meyer (1993) argues that analysis of an organisation’s operational processes will illuminate the most important support process impediments and do so within the context of meeting customer needs. Value to the patient is added if process activities lead directly to the completion of a patient’s needs. Thus, such an understanding is essential to eliminate variation of practice and, consequently, minimise medical errors and other adverse events.

Causative to this problem is the fact that process management initiatives have not been well interpreted (Lewis, 2000). Numerous healthcare organisations attempt to implement process management initiatives with a narrow focus (Lewis, 2000; Dobrzykowski, McFadden and Vonderembse, 2016) on eliminating process variation, waste, advancing operational performance and reducing medical errors (Dahlgaard, Pettersen and Dahlgaard-Park, 2011; Dobrzykowski, McFadden and Vonderembse, 2016). These initiatives are often designed and planned ‘backstage’ (e.g. by government, public bodies, or hospital managers), out of

sight of the healthcare practitioners that must deliver them on the frontline (Teboul, 2006). The interactions between the frequently diverse actors involved in delivery of such initiatives creates boundaries and dependencies that need to be bridged to realise operational performance gains (Greenhalgh, 2008; Greenhalgh *et al.*, 2008). Implementation takes place within an organisation already constituted from a whole portfolio of services, defined as the multitude of clinical, operational and administrative activities that comprise a hospital. To understand process variation and change, scholars in operations management typically focus on the analysis and improvement of a single unit, the intervention/process itself. There is scant literature exploring different levels of analysis and how this impacts on the performance of the processes (Smart, Maddern and Maull, 2009). Consequently, this research focuses on a specific OM initiative, the clinical care pathway and examines its adoption in a healthcare organisation from two main levels; macro (the Hospital) and micro (the professionals).

OM initiatives aim at eliminating process variation by standardising professional work (Eccles *et al.*, 2005; Dobrzykowski, McFadden and Vonderembse, 2016; Drupsteen, van der Vaart and Van Donk, 2016; Mura *et al.*, 2016). However, in professional services such as healthcare, managers do not enjoy high levels of persuasion and authority over employees, since implementation of the initiative changes the way that professionals work, and professionals typically have the autonomy to decide if, and how, they will implement an innovation (Nembhard *et al.*, 2009; Dobrzykowski, McFadden and Vonderembse, 2016). The healthcare workforce is characterised by a high degree of knowledge specialisation associated with professional autonomy (Leape *et al.*, 2009). By virtue of control of their specialised knowledge, healthcare professionals are given supreme authority over clinical practice (Nembhard *et al.*, 2009).

This high degree of specialisation in healthcare settings implies that each professional carries only a part of the knowledge necessary for delivery of care. While most OM process management initiatives require the collaboration of numerous specialists to deliver care, even if inter-professional collaboration is significant for the successful adoption of OM initiatives, this is often missing from practitioners' interactions. Its omission results in the delivery of a lower quality of care (Baker, 2001). Consequently, there is still a need to try and understand, and better characterise this "distinct environment for managing operations" (Goodale, Kuratko and Hornsby, 2008) to develop a profound insight into what happens when practitioners, with different knowledge, background and skills come together to practice, under the requirements of an OM initiative. Such knowledge will empower healthcare practitioners and operations managers to better design process and

implementation strategies to improve delivery of care and operational performance. To this end, the researcher sought to better understand what impacts the adoption of OM initiatives in knowledge-specialised settings such as healthcare, by answering the following research questions:

1. What, if any, are the distinctive characteristics of standard professional/judgement (healthcare) work? and
2. What are the challenges associated with implementation of standard work in a professional (healthcare) operations setting?

By studying the adoption of a stroke care pathway in a healthcare setting, this research has two inter-related objectives as illustrated below:

1. Conceptually, the research seeks to contribute to (i) understanding of the factors that influence the dynamics of adoption of OM initiatives within healthcare organisations, and thereby (ii) reframe and extend current understanding of quality improvement processes (in particular in a healthcare setting).
2. Pragmatically, the research will be used to suggest practical improvement options to enhance the development and adoption of QI initiatives in healthcare settings.

1.3 Significance of the study

Clearly the adoption of QI process-management initiatives is a significant challenge particularly within the fast-growing need of the hospital to improve their effectiveness and efficiency. There is a need for greater insight into QI initiatives' design in healthcare organisations. This research seeks to redress this imbalance through vigorous theoretical and empirical analysis.

Addressing the research questions, this research provides contributions that will be presented in Chapter 6. Several research propositions which stipulate the design and process of adoption characteristics of QI process-improvement initiatives aiming in improving patient care are formulated. Summarising, this research makes three interrelated contributions to the existing HOM literature:

Firstly, this study extends the knowledge on QI initiatives design logic, focusing on the flow dependency. The research findings illustrate that characteristics of individual initiative/processes that collaboratively exist in the organisation with the particularly process impacts its adoption. Specifically, the need of the QI process improvement initiative to share hospital resources, and integrate with other extant formal and informal care pathways, manifest in hospital KPIs, flow charts (and other artefacts) diagnostic disputes and the basic geography

of the Hospital illustrates the need for a multi-faceted/level notion of process future pathway design.

Secondly, this research brings insights from the theory of organisational routines (ORs) literature to better understand process-improvements' adoption. In our knowledge, efforts to combine these two bodies of literature (HOM and ORs) were limited. This study, by building insights from the routines literature, displays that process-improvement initiatives' artefacts (diagrams, instruction manuals, software, etc.) can offer a critical insight into a key challenge for 'standard' (and the standardising of) professional work: individual autonomy. Autonomy with respect to specific (care) judgements is arguably the characteristic of such knowledge work but it unavoidably leads to differential interpretation (diagnoses, models of care), negotiations and consequential "turf wars". Artefacts can be a significant visual/physical manifestation of these 'zones of autonomy'. As a result, OM scholars need to move beyond a normative (this is the flow, etc.) view on process artefacts (e.g. process maps simplistically labelled 'as is' and 'to be').

Thirdly, this study extends existing literature related to the design of QI initiatives and shows that the notion of continuous improvement needs to be revisited in professional/knowledge-intensive work settings. Specifically, the findings of the study show that the process-improvement initiatives' design should consider mechanisms for knowledge sharing between (professional) individuals. Some of this relates to the above propositions, complete characterising of the pathway, vigorous consideration of professional autonomy (and use of artefacts to help understand and improve the inevitable 'design as negotiation' process) but the research also emphasizes the importance of investing in support of relational resources between healthcare practitioners. In this study, empirical support was found to the relationship between the physical proximity of practitioners, their communication both for the exchange of administrative and medical information, and for their co-operation (decision making). Therefore, this researcher suggests that QI design characteristics should consider the organisational structure and support the physical interaction of practitioners.

The research is expected to influence both healthcare practitioners and academic communities, with academics from the fields of HOM, healthcare QI and ORs being the expected audiences. Due to the descriptive and technical nature of much of the extant HOM literature, a major contribution of this research is theoretical understanding that can inform future design and development of QI interventions. This particular contribution is well aligned with recent calls within the HOM, and OM literature in general, to develop greater theoretical understanding of how operational changes happen in complex, knowledge-intensive settings (Swinglehurst *et al.*, 2010; Ponsignon, Maull and Smart, 2014).

Researchers in ORs will find relevance in the insights presented here, as through identification of the dynamics of change underlying successful implementation of complex clinical care pathways, this study provides insights to the organisational routines sub-field (Swinglehurst *et al.*, 2011a).

Healthcare practitioners should also benefit from these findings and insights, as they will be able to utilise them in planning and implementing more effective QI initiatives, leading, in turn, to enhanced quality and delivery of care in their organisations.

1.4 Outline of the thesis

The rest of the thesis is structured as follows.

1.4.1 Chapter 2: Literature Review

This chapter provides an in-depth review of the literature review in the three interrelated areas of research: Healthcare Operations Management (HOM), Process Management and Organisational Routines (ORs), building the conceptual framework for this study. The literature on HOM provides the canvas in this effort. It enables the researcher to gather more insights into the macro system-level factors that inhibit the successful implementation of OM initiatives in healthcare organisations. Conceptualising the clinical care pathway as a standardised meta-routine aimed at improving the healthcare process at a more theoretical level, the literature on ORs provides the context in which patient care occurs and yields deep insights into the micro factors shaping variation of the process. By synthesising concepts from these two literatures, the research develops a more complete picture of how healthcare practice occurs, and the potential factors that challenge healthcare organisations' attempts to adopt management QI approaches.

1.4.2 Chapter 3: Methodology

This chapter describes the framework of inquiry; the ontological and epistemological foundations of the research, the methodological choices, selection of the setting and data collection and analysis methods. This research adopts a pragmatic philosophical perspective and the methodology of mixed methods was selected. Informed by the literature of routines, the researcher employed an extensive and intensive use of qualitative research methods to collect data for both ostensive and performative aspects of the acute stroke care process. Specifically, the researcher conducted interviews and undertook document analysis to collect data for the ostensive aspect of the process, from which scripts and process maps were developed. These were reviewed with the practitioners to assure their descriptive validity. The researcher then undertook non-participant observations of the stroke care process and

semi-structured interviews (using these process maps) to collect data for the performative aspect of it. The researcher spent 185 hours in the field and documented 52 complete patient trajectories through the pathway during a period of 8 months. Performances of routines were collected and compared utilising a framework derived from a coding scheme, which was initially informed by the literature. The researcher then identified patterns in the relationships between the observed process variations and implementation issues in order to determine the implications. Finally, the researcher conducted a basic quantitative descriptive analysis of routinely collected (secondary) patient activity data provided by the Hospital.

1.4.3 Chapter 4: The case study

The case study at the empirical core of the thesis is a detailed description of the implementation of an acute stroke care pathway in a UK NHS hospital. The presentation of the hospital implementation experience will be structured around the elements of the stroke care pathway. A brief description of the official version of the sub process, derived from formal national and local documentation is presented in text and diagrammatic form. Where appropriate/available, secondary data describing hospital and pathway performance are also provided. Using these ‘official’ descriptions as a starting point, the primary data observing variations (noting the number of instances and types) in each official sub process are then detailed in text and diagrammatic form.

1.4.4 Chapter 5: Discussion

In this chapter, the findings from the data analysis chapters are discussed within the context of existing literature to address the research question. As expected there is considerable variation in the practice of stroke care. Rather than being structured and logical as presented in the pathway documents, the care process was typically chaotic and unpredictable. Specific analysis of the component parts of the pathway suggested that variations of the pathway were primarily attributable to an internal conflict between implementation of the pathway and the pre-existing Hospital care portfolio. This misalignment of Hospital functions had a negative impact both on the stroke pathway and overall organisational performance, manifesting in three distinct areas:

- Formalisation of the pathway: formal design of the pathway and its associated process, defined how practitioners interacted resulting in variations of the flow.
- Fragmentation of capacity (hospital resources were shared among multiple departments): The incompatibility of the stroke pathway structure with the structure of the organisation, resulting in conflicting performances, was also demonstrated in a range of concerns

about capacity. Political and professional dimensions of resourcing were observed, often undermining patient flow.

- **Conflicting Key Performance Indicators (KPIs):** Misalignment of the pathway targets with the other pre-existing Hospital targets and goals induced 'quasi-competition' for necessary resources between the stroke pathway and other pathways and treatments.

With regard to the second research question, the researcher found that when OM initiatives are introduced in a knowledge-intensive setting, their operational performance is influenced by:

- **Professionals' incongruent (disparity) mental model of care** (defined as competency and interest in stroke care): the extent of congruence around shared medical goals and objectives impacted on team collaboration.
- **Organisational hierarchical structure:** differences between practitioners' roles were a source of power dynamics, negatively impacting on knowledge sharing and learning among the practitioners.
- **Co-location** was an under-utilised mechanism for the promotion of knowledge-sharing needed to reduce the effects of individual professional autonomy

1.4.5 Chapter 6: Conclusions

This chapter presents the conclusions, the theoretical and practical contribution of the study findings, notes the limitations of the study and provides suggestions for further associated research.

2 Literature Review

This chapter begins by reviewing the two main bodies of literature that have been used to inform this study. Given that the thesis describes an investigation into the adoption of a clinical care pathway; interdisciplinary care plans (ICP) that summarise the optimal sequencing and timing of interventions for patients with a particular diagnosis, procedure or symptom (Ignatavicius and Hausman, 1995; Campbell *et al.*, 1998; Atwal and Caldwell, 2002), the discipline of Healthcare Operations Management (HOM) - concerned with the analysis, design, planning and control of the steps needed to provide care (services) to patients (Vissers and Beech, 2005) - offers a natural academic setting. Development of clinical care pathways is an OM approach that targets care processes and draws on a specific sub-field of HOM; process management/Quality Improvement (QI) (Butler, Leong and Everett, 1996; Johnston, 2005; Ting *et al.*, 2009; Foundation, 2013; Dobrzykowski and Tarafdar, 2015). Particular emphasis was placed upon literature that examines the experiences of healthcare organisations concerning the adoption of OM QI initiatives. Given that healthcare is a professional industry, insights from other professional service organisations are also included.

In the extant literature examined, researchers are concerned with two different interconnected organisational levels – the organisation, defined as the macro level and the practitioners defined as the micro level. A primary notion is that an organisation, a system of interrelated processes that interacts with external environments (Batista, Smart and Maull, 2008), comprises a set of parts or elements that work with each other to form a whole (Batista, Smart and Maull, 2008). This involves complex interactions between its essential parts/elements. Therefore, in order to understand how the organisation works, identify process inefficiencies and ineffectiveness and then improve on them, it is not enough to only study a single process, or part of the system, but it requires understanding the organisation, and the multiple interrelated processes as a whole. Critically, processes can only be understood and then managed at the system level where emergent properties of their interactions with other processes, and parts of the organisation are manifested. Although, some researchers in the literature of process management started recognising the importance of studying processes systemically, the literature in HOM and QI is predominantly practical and empirical, mainly focusing on macro system levels that influence practice of care, thus this research also draws on insights from organisational routines (ORs) literature to better understand the microsystems that explain change.

ORs literature combines the idea of routines as processes, with an emphasis on individual action (microsystems) enabling the researcher to explore the theoretical underpinnings of individuals' interactions with the organisation, and the pathway itself, explaining how operational changes happen in complex settings and the impacts of adoption processes.

This chapter begins with an outline of the review methods used for the collection of the literature analysed. After the HOM/QI literature follows an analysis of the factors found in the literature and an explanation of the challenges of adoption. Next comes the ORs literature, with a specific focus on healthcare. The chapter ends with a summary and a synthesis of the literature for the purposes of building a conceptual framework for this thesis.

Review methods

The literature review method was divided into three sections: the first focused on literature related to HOM and process QI; the second on healthcare management and implementation of process management approaches, and the third on ORs, particularly those found in healthcare settings. The researcher retrieved studies from biographic databases: Google Scholar, Emerland and Pubmed. These databases were searched from their inception dates until December 2016. The reference lists of relevant papers were also reviewed for selection of additional literature. Table 2.1. below presents the keywords used and the results of each search conducted in the literature.

Area	Initial keywords	Papers	Inclusion criteria	Final Sample
Healthcare Operations Management and Quality Improvement	“Healthcare” AND “operations management” OR “process improvement” OR “process management”	251	(1) Work conducted within healthcare setting (2) Main focus was on improving healthcare processes by using OM concepts and/or methods (3) Work content relevant to the study	135
Implementation of operations management approaches in healthcare settings	“Healthcare” AND “operations management” OR “process improvement” OR “process management” AND “implementation” AND “pathway”	142	(1) Work conducted within healthcare setting (2) Main focus was on implementation of operations management approaches (3) Work content relevant to the study	45
Organisational Routines	“Organisational routines” AND “Implementation”	320	(1) Authors used ORs theory to study implementation process (2) Consider study in any context (3) Work content relevant to the study	64
Organisational routines in healthcare	“Organisational routines” AND “Implementation” AND “Healthcare”	60	(1) Work conducted in healthcare setting	43

Table 2.1: Search method of Literature Review

2.1 Healthcare Operations Management (HOM)

Numerous issues adversely affecting healthcare organisations such as long waiting times, patients being treated/accommodated in corridors, increase of medical errors, exhausted and stressed medical practitioners and a general lower quality of delivery of care, turned the attention of healthcare organisations to the scientific field of knowledge operations management (OM) (Tucker, 2004).

2.1.1 Operations management (OM)

Operations management is the action of managing processes that create and deliver services and products. Processes are considered as generic factors in all the organisations. These are the way that things get done (Armistead, Printchard and Machin, 1999; Vissers and Beech, 2005, p. 40). They are a structured, measured set of activities designed and intended to produce a defined output for a specific customer or market (Smart, Maull and Childe, 1999). They have been defined as input-output transformations. Bohmer (2009, p.117) defines a care process as “the set of tasks and decisions that takes the ‘input’ of a sick patient (plus some other resources, such as capital, labour, and raw materials) and converts these into a value-added ‘output’ – namely a patient whose health has improved”. Resources in terms of both organisational and individual processes need to be managed.

Processes are hierarchical in nature and are essentially independent as outputs of one transformation are input to another. A business process which is mainly what this thesis is interested in, differs from a simple process in the sense that is typically cross-functional and customer facing (Smart et al., 1997). Each complete business process may be alienated structurally, into smaller sub-processes, tasks and activities, but not functionally as these are combined to produce the same output (Maddern et al., 2014).

By way of an example, consider the process that a stroke patient goes through within a hospital. In this example *inputs* are (a) physical resources such as the different practitioners (i.e. nurses, physicians, healthcare assistants, paramedics etc.), the machines and equipment used for diagnosis and treatment of the patient, any raw materials used by practitioners during the process, the physical facilities (i.e. building etc.), (b) the patients themselves and (c) the administrative, medical information necessary for the process to be carried out. *Processes* represent the activities undertaken by different actors, such as the stroke doctor, nurses, bed managers and many more to carry out patient care (i.e. carrying out diagnostic tests, patient assessment, patient treatment, communication between actors, data management etc). The final *outcome* in terms of service delivered to the patient is therefore the result of the set of activities organised in a process – service, patient health outcomes etc.

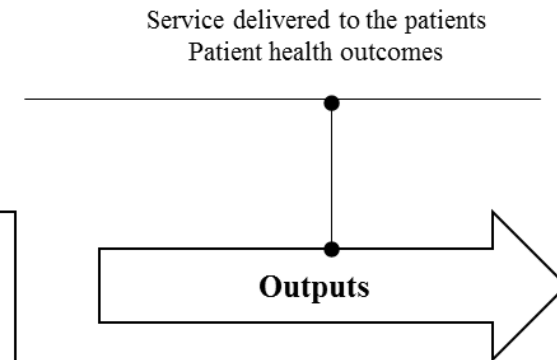
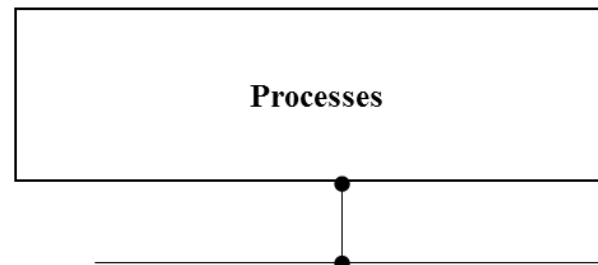
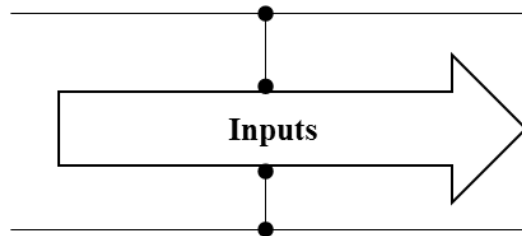
(Visser and Beech, 2005).

Holden *et al.* (2009) distinguishes the input factors of input-transformation-output model in healthcare to:

- *Patient and healthcare professionals' factors*: these are characteristics of individuals such as age, health status, personal needs, experience and education etc. language and knowledge.
- *Task factors*: these are characteristics of the work that healthcare professionals have to carry out, as well as characteristics of the workflow, professionals' workload, time and job pressure or control.
- *Technology and tool factors*: these factors refer to the role of technology in the organisation. The quantity and quality of the technology that healthcare professionals use. The design of tools and technologies would also be included.
- *Environmental factors*: these are the structures of the environment in which healthcare professionals work (i.e. noise, light, physical space and layout, etc.)
- *Organisational factors*: these are characteristics related to the structural, cultural and policy of the healthcare organisation (i.e. regulations, management, supervision and leadership, hierarchical structure etc.)
- *External environment factors*: these are factors that are outside the system

Figure 2.1. Illustrates an input-transformation-output model.

- Patient and healthcare professionals' factors: age, health status, knowledge etc.
- Task factors: features of the healthcare professionals work, workflow etc.
- Technology and tool factors: quantity and quality of organisations' technology
- Physical facilities/material (i.e. buildings, staff, equipment etc.)



Service delivered to the patients
Patient health outcomes

- Environmental factors: characteristics of the professional environment (i.e. noise, physical layout etc.)
- Organisational factors: cultural, structural and policy related factors (i.e. strategy, leadership, regulation etc.)
- External environmental factors: factors outside the system (i.e. economic conditions of the country etc.)
- Information that is being processed or used in the process

Communication
Data management
Diagnostic and therapeutic activities
Patient assessment & decision making

Figure 2.1: All operations are input-transformation-output models

However, despite its clarity, some distinctive characteristics of healthcare organisations challenge the effectiveness of the model. For many years, healthcare organisations were designed and structured around professional bureaucracy (Gonçalves, Hagenbeek and Vissers, 2013). This resulted in healthcare processes with high levels of complexity fragmenting across multiple hospital departments because they were planned according to medical skills or specialisations and not based on the process of the patient that received the care (Lee and Clarke, 1992). Such design and organisation of hospitals created challenges in the coordination and control of care operations resulting in lower quality and efficiency of care (Gonçalves, Hagenbeek and Vissers, 2013). Policies implemented into the hospitals impacted healthcare processes at different levels (e.g. individuals, team, hospital, government). Therefore, to improve their operations, hospitals began to focus on the management of their processes.

2.1.2 Process orientation in the hospitals

Managing processes focuses on planning and monitoring efficiency and effectiveness of the organisation (Vissers and Beech, 2005). It emphasises the maximisation of the service level, particularly the timeliness of care delivery and use of resources. Healthcare processes are highly interdependent. They usually involve multiple individuals from several professions working together, interdependently, to deliver care, thus coordination of their work is necessary. Coordination refers to management of the dependencies between the interrelated activities of the process (Malone and Crowston, 1994). Process is a series of dependencies. Malone *et al.* (1994) discuss three types of dependencies that hospitals should consider in relation to coordinating processes and improving operational performance: flow dependency; this exists when one activity produces a resource that is used for a subsequent activity. Sharing dependency; when a resource is used for multiple activities, and fit dependency; when multiple activities combine to produce a single resource.

Considering these process dependencies and trying to overcome operational challenges, healthcare organisations frequently employ OM tools, techniques and practices coming from the industrial sector (Felicio, Gonçalves and da Conceição Gonçalves, 2013; Peltokorpi *et al.*, 2016). Most of these methods are based on Shewhart and Deming's principles of QI (Hackman and Wageman, 1995); the elimination of variability is the key to quality. Variability of processes is the degree of difference in the same process when repeated.

Variations of healthcare systems are defined by two types (McLaughlin, 1996). The first ones are called intrinsic (common cause) variations that are produced naturally and are not controllable from the system. For instance, the random arrival of patients in ED or

differences in the time that it might take to complete a physical task, or that doctors never have the same consultation with the patient or surgical procedures are never repeated the same way more than once. Natural variability is not always ‘bad’, but it is essential to successfully deal with individual differences between patients and their needs and deliver safe care. Artificial variability on the other hand is needlessly caused by inefficient control and planning of the healthcare system. Artificial variability can be omitted with better planning and/or scheduling, or by implementing standardised working procedures (Berwick, 1991; Litvak et al., 2005). Counter-intuitively, artificial variability may have a superior influence on health outcomes to natural variability (Joosten, Bongers and Janssen, 2009). For example, in their work McManus et al. (2003) found that artificial variability defined as the number of scheduled admissions had a greater negative effect on overcrowding on an intensive care unit than the natural variability defined as the unscheduled admissions. In their work Litvak et al. (2005) classifies variability in care practice in three sources; firstly, clinical variability which refers to the pressure arising from the variation in nature and severity of patients’ disease. Secondly, flow variability which refers to the variability arising from patients’ rate of arrival for hospital care. Thirdly, professional variability which refers to the stress of the process caused from the variation in what originates in the knowledge, abilities and opinions of the healthcare providers.

Quality management efforts can successfully reduce unnecessary and controllable variation and erodes quality and reliability, and adds unnecessarily to costs (Berwick, 1991). The most typically employed best practice categories found in the HOM literature that are used to continuously improve the efficiency and quality of the healthcare delivery include Lean Healthcare initiative (Young and McClean, 2008), Sigma (Miller, Ferrin and Szymanski, 2003; DelliFraine, Langabeer and Nembhard, 2010), Model of improvement [plan-do-study-act (PDSA)] (Kenny, Johnston and Qureshi, 2014), management of the workforce, planning and control as well as quality management system (Tucker and Edmondson, 2003; Dahlgaard and Dahlgaard-Park, 2006). To better understand what is happening in the structure of primary processes; existing healthcare processes, transparency and standardisation of the processes are necessary, thus hospitals also employ OM methods and tools such as clinical practice guidelines (Hoot *et al.*, 2008), improved documentation (Øvretveit *et al.*, 2007) and standard operating procedures such as clinical care pathways (Pearson *et al.*, 1995).

Empirical evidence indicates that the implementation of OM process management initiatives yields mixed results for healthcare organisations’ performance. On the positive side, adopting OM initiatives can help improve medical outcomes such as reducing patient

mortality (Brown, Tucker and Domokos, 2003; Patterson *et al.*, 2012), and health complications (Brown, Tucker and Domokos, 2003). They can also assist in enhancing operational outcomes such as service delivery and workforce efficiency (McDermott and Stock, 2007), reduced waiting times for assessments and treatments, reduced lengths of stay in hospital, all of which have resulted in better outcomes for patients (Allen and Rixson, 2008). OM initiatives have also shown to enhance capacity level of the hospital. The capacity of the process is generally defined as the maximum number of products that can be produced in a given time (Terwiesch, Diwas, and Kahn, 2011). Although this definition gives the overall view, capacity can be separated between input and output. Input or productive capacity (as it is also called) is the resources (e.g. facilities, equipment, and workforce) used for the creation of products. While output capacity is the number of products produced within the given time. The need to match highly changing demand with available hospital capacity and improve operational performance is one of the most important challenges that hospital managers face in their organisation. OM initiatives have shown to support their efforts (Allen and Rixson, 2008).

On the negative side, analysis of secondary and survey data, by Douglas and Freendall (2004) did not find any significant relationship between process improvement initiatives with financial performance or customer satisfaction. However, they found important relationship between process improvement initiatives with Joint Commission Audit Score¹. Similarly, Carman *et al.* (1996) failed to discover noteworthy relationships between process management initiatives and several measures of hospital performance such as cost per patient admission, length of stay, staff productivity, patient satisfaction and market share.

Other studies have also found mixed results. McFadden *et al.* (2015) found that OM initiatives were related to increased incidences of acquired health conditions, but positively correlated with patient outcomes. Likewise, Gowen *et al.* (2012) found that lean initiative reduced medical and hospital errors, but after adjusting their model for other process improvement approaches, they found no significant improvement in organisational effectiveness. The inconsistency of research findings validates the need to: (1) further explore the factors influencing the impact of OM initiatives on the effectiveness and efficiency on hospital performance and (2) examine the factors that influence their successful adoption in healthcare organisations in the study of process improvement.

¹ The Joint Commission (TJC) audit score, are standardised measures of quality developed by TJC collected by U.S. hospitals. These measures have been endorsed by the National Quality Forum and adopted by the Hospital Quality Alliance, with the aim to successfully monitor and track hospital improvement and identify disparities in performance.

This study focuses on a particular OM initiative; clinical care pathways. Although the effect of critical pathways on patients' outcomes has been extensively discussed in the literature, the outcome of their implementation is far from straight forward (Saint et al., 2003; Deneckere et al., 2012). Designing a clinical pathway may be a significant element, but real-life implementation and acceptance by inter-professional teams is not an easy task to achieve. As already illustrated above, clinical care pathways take the form of an input-transformation-output model, having a series of dependencies, which need to be considered in their design and implementation processes.

The need for more important understanding of what is required for successful implementation of QI and regeneration of the organisations has arisen gradually. Numerous scholars have recognised the relationship between the systems theory and the nature, the assets of processes and process management (Maull, Childe and Weaver, 1995; Smart et al., 1999; Batista, Smart and Maull, 2008).

2.1.3 Systemic perspective of process management

A central percept of process and QI is that organisation should be seen as systems of interlinked processes (Ravichandran and Rai, 2000). Numerous scholars have recognised the relationship between the systems theory and the nature, the assets of processes and process management (Maull, Childe and Weaver, 1995; Smart et al., 1999; Batista, Smart and Maull, 2008). System theory provides a set of concepts and principles that are similar to all systems, thus enabling scholars in the area of science to study behavioural phenomena (Batista, Smart and Maull, 2008). The systemic paradigm has changed the way that scholars analyse organisations by suggesting that the causal and responsive relationships occur in a more complex system of relationships and they should be analysed regarding their relationship with the larger system (Turner, 1978; Batista, Smart and Maull, 2008). Organisations are viewed as systems that have continuous interaction with and external environment and receive both external and internal impact that can drive improvement in processes and outcomes (Ravichandran and Rai, 2000; Batista, Smart and Maull, 2008).

Previous work has indicated that processes are analogous to a system (Smart, Maull and Childe, 1999; Batista, Smart and Maull, 2008). A system performs a process transforming its inputs to outputs (Smart, Maull and Childe, 1999). A main idea of the system perspective regarding the process is that a system is a set of processes that work with each other to form a whole. Maddern et al. (2014) explains, system of processes is comprised from many processes that interact between them to deliver the objectives of the business. The main implication of this vital idea is that the understanding of a single process is not sufficient to

understand the whole. It is the interaction between all these processes that makes each system unique (Ravichandran and Rai, 2000; Batista, Smart and Maull, 2008; Madden et al., 2014). There are explicit boundaries that distinguish each process between them and from their environment (Madden et al., 2014). These boundaries are usually defined by the controls that measure the performance of the process/system and those originating from the environment of the system (i.e. regulation) (Madden et al., 2014). The capacity of a process to meet its objectives is affected by the interactions with the other present processes and units across the existing boundaries (Smart, Maull and Childe, 1999). Thus, to completely understand a system of processes, it is necessary to analyse the association between them and the system with other systems (Batista, Smart and Maull, 2008).

Improvement and regeneration of an organisation is fundamentally concerned with introducing into the organisation the capacity to re-form and renew itself continually (Tranfield and Smith, 1998). The majority of operations management scholars' view of organisation as a behavioural system is consistent with the macro-organisation design. Underlying the systemic paradigm of QI is the notion that employees work in an organisational system where both their individual behaviour and that of the system can be altered through changes to the elements of the organisational system (Ravichandran and Rai, 2000). Leadership, structural arrangements, and organisational processes are assumed as the major building blocks of an organisation that could be altered to achieve the desired performance (Ravichandran and Rai, 2000). A generally accepted association between these elements is that leadership determines the formation of structure and processes essential to attain organisational goals (Melcher 1976). Furthermore, processes are controlled (measured for their performances) partially through the design of structure (Melcher 1976; Robey 1986). Usually, organisational structure has been defined as mechanisms that are taken to preserve patterns of behaviour among people. It includes notions such as hierarchical structure, organisational policies, job descriptions, control (performance measurement) and coordination mechanisms - procedures, and reward schemes that impact the behaviour of organisational members.

An important element of organisational capabilities is organisational routines, usually being missed from the analysis of HOM scholars. Routines are a recognised feature of organisational behaviour (Barazza, Bou and Cataldo, 2008). These are repetitive, recognisable patterns of interdependent actions, carried out by multiple actors (Feldman, 2000). They comprise the repetitive patterns which co-ordinate activity within an organisation and are usually assumed to be much more persistent than initially might be thought, even in environments assumed as non-repetitive (Pentland and Rueter, 1994).

Routines are “are the micro assets of an organisation whose main function is to integrate work activity” (Tranfield and Smith, 1998, p.119) and are important to analyse to achieve process improvement (Tranfield and Smith, 1998). Cyert and March (1963) identify routines into the category of task performance and standard operating procedures. This is similar to the definition suggested by Pava (1983), who defined routines as: “processes are characterised as systems that address familiar but slightly dissimilar events through repetitive planning systems, decisions rules and algorithms, which lead to routinised behaviour” and with Nelson and Winter’s definition that stated, “that range from well-specified technical routines for producing things through procedures for.....” (1982, p. 14). Therefore, because routines are designed from the very particular historical and current mixture of organisational features such as structures, technologies, people and others are almost incredible to replicate or “buy-in” (Tranfield and Smith, 1998).

Routines can be seen as another type of processes (Lillrank, 2004). An assumption of the classical quality management literature is that processes are identical or almost identical to activities performed towards a predetermined aim (Lillrank, 2003). This concept follows the basic idea that standards are applied to activities that are repetitive in an identical fashion and employees should follow standards to carry out systemically their work (Takeyuki, 1995; Davenport, 1993; Lillrank and Lillukko, 2004) in order to achieve organisational objectives. Lillrank (2003) distinguishes between standard, routine and non-routine processes. Standard processes have a defined set of inputs, procedures and output. While routine is another type of processes that can have one or more set of inputs and outputs. The essential thing about routine processes is that are not mindless but, assessment and organisation of input, and collection from a finite set of actions. The overall aim of routine is clear, but the output can be produced through different/alternative actions. All the work processes are carried out through routines.

Routines can be viewed as including both:

The formal system processes and procedures by which issues, difficulties, adoptions, alternatives, assessments and choices are made by the specification of routines.

And informal, unspoken and comparatively unintended and emergent activities, such as informal decision-making, with organisational members rarely able immediately to understand and articulate the true nature of the routine they operate. Although sometimes these unplanned routines have a positive impact on the work, this is not always the case. For instance, also applied to this study, the over devotion to systems and procedures by hospital staff (Menzies, 1967) and by the organisational arrangements of merchant seamen (Herbst, 1974). In these cases, routines were followed, or new routines were created, as automatic

responses, and guided organisational members to act at the expense of progressing the formal task of routines.

Therefore, understanding the routines from both elements can provide insights for design and improvement leading to the improvement of organisational performance. Studying, reviewing, reshaping and substituting routines either as “automatic responses” or “effortful accomplishments” (Pentland and Reuter, 1994) is essential to achieve change in the management for routines

...occupy the crucial nexus between structure and action, between organisation as an object and organising as a process (Pentland and Rueter, 1994, p. 484).

Analysing formal systems in this way can help reduce visible dominant but tacit strategic logics (Prahalad and Bettis, 1986), while analysing the development of unplanned routines can assist in reducing such behaviours that work against the quality of the organisation.

Clinical care pathways can be understood as a type of routine process; repetitive sequential patterns introduced to healthcare organisations as methods for co-ordinate the activity of practitioners, through the standardisation of their actions (Van Gerven et al., 2010). Viewing clinical care pathways as meta-organisational routines introduced to the healthcare organisation, this entails two elements; the formal processes and procedures, and informal, emergent activities. Understanding the factors that create the gap between those, is vital for the improvement of their design and implementation. Therefore, extant literature on routines can help researchers understand the challenges of healthcare settings in managing the processes.

2.2 Organisational routines (ORs)

Routines are chronological structures that are often used as a way of accomplishing organisational work (Feldman. 2000). Routines are important to the organisations because much of organisational work is carried out through routines (March and Simon 1958; Cyert and March 1963; Nelson and Sidney 1982), or recurrent patterns of action. Hannan and Freeman (1984), define organisations as structured systems of routines entrenched in a network of interactions with the external environment (Amburgey, Kelly and Barnett et al, 1990). Routines are widely accepted as an essential “micro” unit of analysis for understanding and explaining different “macro” organisational phenomena (Felin and Foss 2009). Particularly, researchers used the concept of ORs within their efforts to study stability and change (Feldman 2003; Feldman and Orlikowski 2011; Pentland et al. 2010), organisational learning (Levitt and March 1988), organisational capabilities and (Eisenhardt and Graebner 2007), the implementation and use of technology (Orlikowski 2007;

Swinglehurst et al. 2011), inertia and path dependence (Sydow et al. 2009) and finally the formation and development of strategies (Koch 2011).

In early OR literature, ORs were defined as stable, fixed recurrent action patterns (Winter and Nelson, 1982), standard operating procedures and rules (Becker, 2004). Proponents of that definition conceptualised routines as “repeated patterns of behaviour that are bound by rules and customs and that do not change very much from one iteration to another” (Feldman, 2000).

Assuming that actors respond to recurring tasks in an expected and predefined way (Geiger and Schröder, 2014), routines were introduced as a means to control the work of organisations by introducing consistency in many simultaneous activities and thus making it easier to monitor, measure and evaluate the work (Cyert and March, 1963). Therefore, from the individual perspective, routines were characterised as mindlessness (Cohen and Bacdayan, 1994) although their application ensured stability and efficiency in organisations (Cyert and March, 1963).

In recent years, the discussion and study about ORs has changed (Geiger and Schröder, 2014). Routines are seen through the lens of practice theory (Parmigiani and Howard-Grenville 2011; Feldman 2003). Advocates of this perspective are interested in understanding “how” the actual patterns of routines are performed, reinforced or change (Feldman et al. 2003), instead of “why” and “what” is their impact on the organisation (i.e. efficiency). They define routines as ‘recognisable, repetitive patterns of interdependent actions carried out by multiple actors’ (Feldman 2000). This definition emphasises the role of actors in production and reproduction of action patterns and to what extent the patterns remain stable or change over time. Individual agency becomes a central concept in understanding ORs (Feldman and Pentland, 2003).

Pentland et al (2005) distinguish between individual and organisational routines. The latter, which are the routines we are interested in this thesis, involve multiple actors, with different professions, cited in different locations across the organisation and carrying out the routine/process through their interactions. The actions of the multiple actors “form a pattern that people can recognize and talk about as routine” (Pentland et al 2005). In healthcare settings, and regarding to this research, ORs can be seen as “predefined management plans for a particular symptom or cluster, diagnosis, or intervention, which aim to make care more consistent and efficient” (Renholm et al. 2002).

Feldman et al (2003), introduced the practice-based perspective of routines distinguishing between ostensive (routine in principle) and performative (actual performance of routines). The authors suggested a generative model of ORs that has been extensively adopted in the literature (Baker, 2001; Swinglehurst et al., 2010; Hayes, Lee and Dourish, 2011; Miller,

Pentland and Choi, 2012; Gao, Deng and Bai, 2014). According to Feldman and Pentland et al. (2003) routines are generative systems involving complex internal structures and micro-dynamics that can produce multiple performances depending on the situations. Feldman et al. (2000) distinguish between ostensive (routine in principle) and performative (actual performance of routines) (Feldman and Pentland, 2003).

2.2.1 Routines as generative systems

Performative aspects of routines represent specific performances of practices, by individuals or groups, of what they believe the routine to be (Pentland and Feldman, 2005). Routines have different performances every time; they are never performed in the same way (Pentland and Feldman, 2005). Each performance of routines created by participants is partly re-enacted from previous performances, partly improvised based on their judgments of previous outcomes and current circumstances and partly designed in their efforts to achieve their future objective and visions (Pentland and Feldman, 2005).

The ostensive aspect of routine is the generalised pattern of the routine. It is an abstract description or understanding by individuals of how the routine should be enacted (Pentland and Feldman, 2005). Pentland *et al.* (2005) argue that the ostensive aspect of routines takes the form of narrative and script. For example, in healthcare, the ostensive aspect of the stroke care process, involves admission of the patient to the hospital, patient triage; brain imaging, treatment and admission to the ward. There is a linear sequence of events with a beginning and an end. However, there is not a single view of the ostensive aspect of routines. Abstract patterns of routines may vary from individual to individual, or according to time and place (Pentland and Feldman, 2005).

Moreover, there is a recursive relationship between the performative and ostensive aspect of routines (Feldman, 2000). Neither the ostensive nor the performative could exist in the absence of the other; each is essential to the mutual constitution of a routine (Feldman and Orlikowski, 2011). Participants use the abstract, generalised patterns of routine (ostensive aspect) to make references in their enactment of routine (Pentland and Feldman, 2005). At the end of each performance, they evaluate the outcomes of their actions, compare with ideals and previous plans, introduce new values and act accordingly in the next iteration of the routine, changing the form of the ostensive aspect. Hence, the ostensive aspect of the routine not only guides the performative aspect of it, but is also shaped by it (Pentland and Feldman, 2005).

Additionally, both ostensive and performative aspects may be constrained by and may form or be formed by various artefacts, defined as “physical manifestation of the ORs” (Pentland

and Feldman, 2005). The most common examples of artefacts are representations of routines such as standard operating procedures (SPOs), protocols and rules. These also may be embedded in software tools that support the performance of routines or decision-making (Pentland and Feldman, 2008; Hayes, Lee and Dourish, 2011). Artefacts are efforts of managers to constrain, coordinate, control and improve work practices. Routine performances are shaped but, also shape artefacts through time (Feldman, 2000; Pentland and Feldman, 2008).

Based on this background the performance of routines and subsequently of healthcare processes should not be viewed as stable, tacit and automatic behaviour (Giddens, 1984; Pentland and Rueter, 1994). But, these are dynamic with an effortful accomplishment of individuals. Routines are shaped from the historical and present combination of organisational features are very difficult to impossible to “buy-in” or duplicate (Trasfield and Smith, 1998; Feldman et al, 2000). But, these include both systems and procedures that the very core of the organisation’s work consists of. Without them the organisation would stop functioning as a task achieving unit (Trasfield and Smith, 1998; Sydow, Schreyögg and Koch, 2009). As well as emergent and unplanned activities, such as informal decision-making of members that have not understood the true nature of the routine they function. Emergent routines are sometimes supportive of the overall aim of the system, but they can also produce a negative impact (Trist and Bamforth, 1951; Transfield and Smith, 1998).

Although HOM and ORs literature share some common characteristics, as explained above, the ORs literature additionally provides the researcher with a better understanding of the micro level dynamics while HOM literature examines the macro level dynamics that impact the adoption and outcome of OM initiatives in healthcare settings. In this study the organisation, defined as the hospital managers and the associated implementation strategy, as well as the organisation as a physical unit, represent the macro level of the health policy adoption. The organisation consists of individuals differentiated from space, time and specialty, who are called to work together and carry out the care process. These represent the micro level of analysis. Following Blumer: ‘a network or an institution does not function automatically because of some inner dynamics of system requirements; it functions because people at different points do something, and what they do is a result of how they define the situation in which they are called upon to act’ (Blumer, 1969, p. 19).

Some significant insights from the two bodies of literature are presented in subsections below. An updated illustration of the IPO (input-process-output) model, incorporating these insights, follows each subsection.

2.3 Insights from the Healthcare Operations Management literature

This section provides significant insights gleaned from HOM literature into the implementation gap between the existence of OM process management initiatives in healthcare and their successful adoption by healthcare practitioners. Supporting insights from ORs are also provided.

HOM studies highlight the impact of the nature of medical work (variable work processes), professionals, resource management on the processes. Figure 2.2 (below), illustrates the key insights from HOM literature for the factors that impact the performance of IPO model in healthcare settings. Variable processes and outcomes, due to high levels of uncertainty in patients' characteristics and demand influence management of the processes. Professional service characteristics such as specialised knowledge, ethical norms and codes associated with individual autonomy, as well as limited managerial control, are defined as both an input to the processes, but also as a directive factor to transformation of processes. The way that the organisation is structured, and the management and allocation of resources amongst multiple patient groups also exerts a key influence on the performance of the processes. This impacts upon the collaborative work of practitioners and shapes their ability to reflect and improve upon their routines.

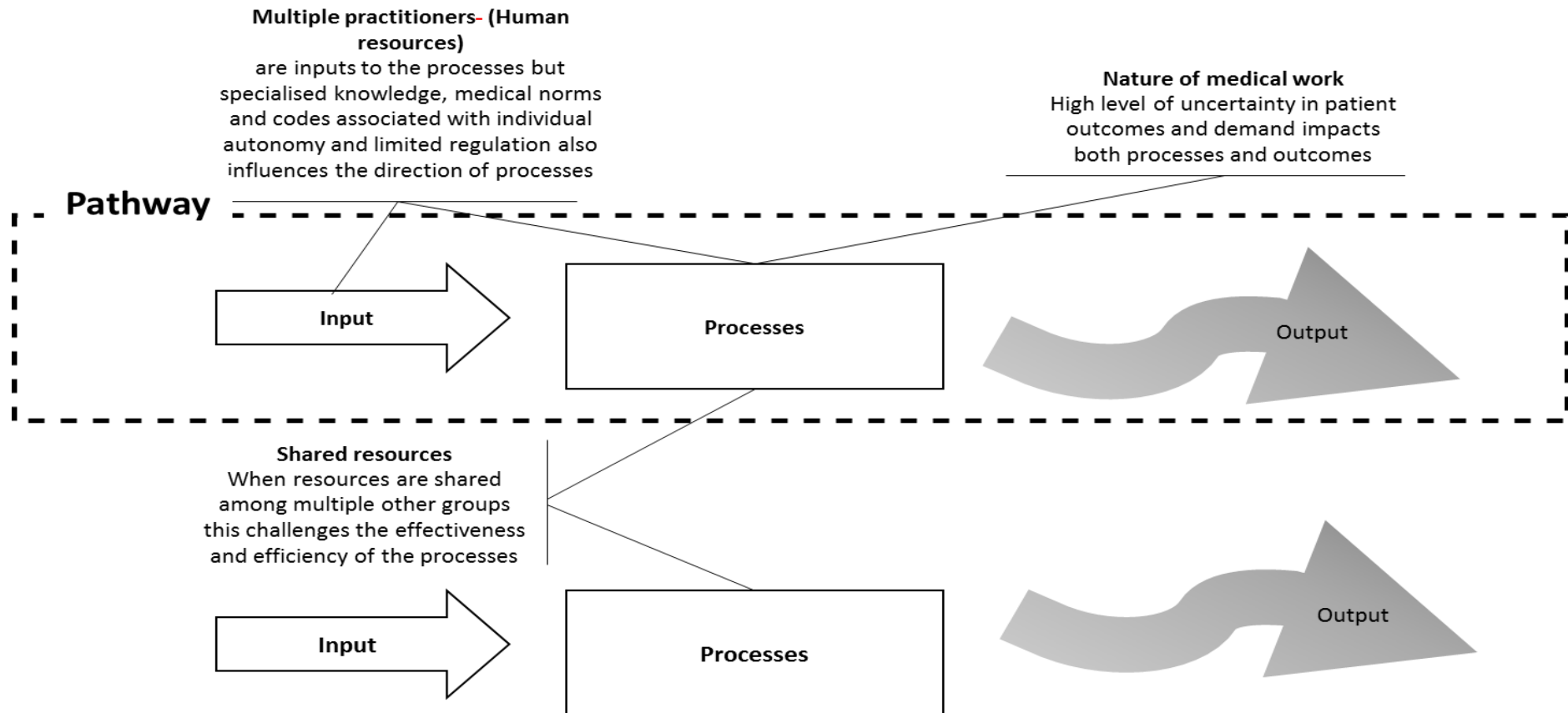


Figure 2.2: Configuration of IPO model with main insights from HOM and ORs literature

2.3.1 Variable work processes and outcomes

Although reducing process variability is a fundamental component of process management QI initiatives, uncontrollable variations (deviation from explicit targets and guidelines) exists in most levels of healthcare organisations making this difficult to achieve, but results in high level of process variety (many different process performances and outcomes). Healthcare organisations are characterised by high levels of uncertainty (Gittell *et al.*, 2000; Nembhard *et al.*, 2009; Ricci *et al.*, 2009). Tucker *et al.*, (2009) explained that the decoration of well-established OM concepts is needed mainly because the level of uncertainty that exists in service organisations such as healthcare, is much higher than in manufacturing organisations (Gittell *et al.*, 2000) where the level of uncertainty is much lower and thus, employees can expect and achieve higher levels of standardisation in their production.

Uncertainty and variation is a serious challenge to healthcare processes, as the individual variation over time is quite substantial and sometimes difficult to grasp (Lifvergren *et al.*, 2010). Firstly, variation exists around healthcare services demand. Matching capacity and demand is a requirement for most management projects (Sousa and Voss, 2002), because it enables managers to identify resource requirements for the provision of care in order to sustain quality (Grove *et al.*, 2010).

Secondly, patients' conditions are dynamic. Disease can develop differently in every patient, usually creating uncertainty in diagnosis of a patient's condition. This results in high variation of personalised interactions between patients and the healthcare provider and consequently in high variety of process outcomes (Shah and Ward, 2007). Treatment for patients also cannot be implemented in the same way as manufacturing product processes, since some patients react to medications in unexpected ways.

These types of uncertainty - in patient characteristics and demand for services - are discussed in ORs literature as uncontrollable environmental factors that contribute to the variation of routine performances. Routine participants have no control over, and cannot directly influence such factors.

2.3.2 Professional inputs

Research also explains variability of healthcare processes in terms of the professional nature of healthcare work. In recent years several scholars have drawn on Professional Services Operations (PSOs) literature stream to study and explain means of addressing the complexity of healthcare delivery and subsequently, the issues around OM initiatives' adoption (Dobrzykowski, McFadden and Vonderembse, 2016). PSOs create and sell products or services by organising professional service providers who have abstract specialised

knowledge and can competently apply it in multiphase and complex cases requiring customisation (Goodale, Kuratko and Hornsby, 2008). PSOs have several unique characteristics that exist in healthcare organisations that are found in the literature to impact OM initiatives adoption (Lewis and Brown, 2012).

PSOs are characterised by circumstances where the judgment of professionals introduces an endogenous variation to work processes and play a leading role in service delivery (Lewis and Brown, 2012). This contributes to slow throughput times and a high degree of service process variation (Schnelle *et al.*, 2004; Lewis and Brown, 2012). All expert or knowledge intensive workers 'locate' their judgements within a knowledge system. The tendency of healthcare professionals to work autonomously has been identified as an obstacle to the adoption of initiatives by many HOM scholars (Tucker, 2004; Grove *et al.*, 2010; Hellström, Åslund and Nielsen, 2010). For example, Grove *et al.*, (2010) studied the challenges of a Lean implementation of a health visiting service within a large primary care trust in NHS UK. They found that the tendency of practitioners to work autonomously created significant variability within the process. Everyone has a different way of practicing, resulting in complications for managers in identification of waste, as required by Lean principles. Similarly, Tucker *et al.* (2004) note that medical work is usually delivered by practitioners that are confident in their expertise and knowledge but lacking in organisational and collaborative experience.

The relationship between the design of the process and the roles of the multidisciplinary personnel involved is fundamental to healthcare processes (Heskett, Sasser and Schlesinger, 2010). Since practitioners are responsible for endorsing and providing the service, during the delivery of care, it is important that they are fully cognisant of the process, and their roles within it and are motivated to practice accordingly. Most care processes are designed and planned 'backstage' – either internally by hospital managers, or externally by governmental bodies - (out of sight of practitioners, but are performed 'front of house' (Teboul, 2006). The medical knowledge for how to solve predictable structured health issues is introduced into these processes via clinical guidelines and care protocols generating demands for specific competencies that healthcare practitioners are required to have in order to resolve a typical health problem. These manifest in terms of types and levels of clinical knowledge, skills, attitudes and training. Interdependent consecutive such as those found within a clinical care pathway are assumed to be suitable for implementation by less skilled practitioners, while iterative processes usually necessitate the input of more highly skilled practitioners (Leape *et al.*, 2009). Differences in practitioners' training, education and skills can determine the efficiency and effectiveness of the process (i.e. the number of repetitions needed to resolve

a specific patient's health problem) (Walley *et al.*, 2006). Put simply, a routine process can become a non-routine process for a less skilled practitioner, whereas a non-routine process can become a routine process for a more skilled one (Lillrank and Liukko, 2004).

Scholars that recognise the collective nature of routines, note that there is substantial heterogeneity in individual-level skills and abilities (Abell, Felin and Foss, 2008; Felin and Foss, 2009; 2012) that results in variation between the ostensive and performative aspects. Individuals' heterogeneity in knowledge and skills associated with individual agency, defined as a source of power that is exerted from individuals, influences routine performances (Feldman and Pentland, 2003). As Becker *et al.* (2004) note, to the degree that individuals' knowledge is specialised, the overlay with the knowledge of the other actors is small or it does not overlay at all. For example, in healthcare, physicians have a high tendency to improvise, based on their years of training, knowledge of medicine and clinical practice, so they often make different decisions about how to practice a given routine. Consequently, individuals that carry out the process do not share the same understanding "of all the possible alternatives and factors that influence the probabilities with which these alternatives drive to certain outcomes" (Becker *et al.*, 2004), adding uncertainty to routine practice.

Lewis and Brown (2012) explain "what makes professional employees different is that this body of knowledge is externally (but non-governmentally) regulated and controlled in its content and application" (Lewis and Brown, 2012). This implies that professionals monopolise the use of that knowledge and regulate this autonomously. Healthcare professionals are assumed as the appropriate ones to decide if it is appropriate to adopt an innovation or not and how to use the innovation (Tucker *et al.*, 2004). They act in such an autonomous way that it prevents standardisation of care practice (Reinertsen and Schellekens, 2005; Buttell, Hendler and Daley, 2007). Buttell *et al.* (2007) explain that probably the most convincing reason we have seen such little progress in adopting QI initiatives in healthcare is that medicine is still a so-called cottage industry, with very little standardisation across physicians, nurses, or hospitals, in respect of how to deliver high quality care. In professional services, there are limited repetitive learning opportunities and a lack of task standardisation, while reliance on professional judgement makes work difficult to be controlled and in pace (Heskett, Sasser and Schlesinger, 1997; Lewis and Brown, 2012).

These knowledge monopolies deliver an outside control over professional service providers that can diminish the influence of hospital managers in healthcare organisations (Harvey, 1990). Unlike in other industries most healthcare managers do not have the professional

knowledge and qualifications of their workers. In other industries once managers introduce an innovation, employees are forced to comply with the implementation efforts (Nembhard *et al.*, 2009). Agarwal *et al.* (2016) studied management practices in Australian healthcare and found that a higher proportion of qualified managers experienced in clinical practice increases management performance since a clinical background contributes to an enhanced understanding of hospital processes and challenges, as well as increasing their ability to communicate credibly with clinical staff.

Professional norms and codes have also been noted to impact upon the successful adoption of OM initiatives. Torres (1991) refers to these norms and codes as ideologies that characterise specific professions, since these professional norms and codes of ethics (Lewis and Brown, 2012) describe suitable behaviour for professionals based on social expectations. Healthcare includes norms that can perhaps account for limited success of healthcare practitioners in adopting innovations. To many healthcare professionals, adoption of an innovation may appear inconsistent with their occupational norms; “make a habit of two things, to help or at least do not harm” (Hippocrates, 400 B.C.).

Similarly, routine scholars argue that individuals may know how to practice their tasks yet decide not to do so due to conflicts between the task and their own personal identity, preferences, values and goals (Greenhalgh, 2008). As Sewell (1992) noted “there is no single, objective routine, but a variety of different perspectives on what is involved”. This discrepancy between individuals’ principles, values and goals, and the resulting deviation from process, presents significant potential for continuous change in routines’ practice (Feldman, 2000). Managers may select and promote routines for the survival of the organisation that conflict with the intentions and goals of individuals, or their skills and knowledge (Becker, 2004; Pentland and Feldman, 2005; Lazaric, 2008; Bruns, 2009). Alternatively, they may promote routines and practices that accord with their personal goals, but which may raise the resistance of practitioners to following the routines, producing consequent negative performance outcomes (i.e. conflict) (Lazaric, 2008). In their study, Essen *et al.* (2008), using empirical data from the Swedish community care setting, investigated the causes of variability in workers’ performance of the routine in situ. They found that differences between personal emotional-ethical values create an essential source of unwanted variability in the performative aspect of the routine. Tsoukas (1996) refer to this as ‘life-disposition’. During the course of their lives and work experiences, individuals develop ethical beliefs that fundamentally influence their perceptions of given routines and of how to react in contextual contingencies of routine in situ. The implication of these findings is that the organisational objectives targeted through the introduction of new

practices, may not be compatible with the beliefs, values and preferred practices of practitioners within the organisation.

Nembhard *et al.* (2009) draw on management research to explain the acute difficulties that healthcare organisations have experienced around service improvement, citing the traditionally risk averse characterisation of healthcare professionals (Papadopoulos, Radnor and Merali, 2011). Although many innovations are introduced in healthcare organisations with the promise of reducing uncertainty and enhancing quality of care, like every innovation, implementation is accompanied by increased incidences of failure in the short term. In healthcare settings in particular, where these short-term failures, may cause harm to patients, practitioners do not seek them out, rather, they actively seek to avoid them. Yasin *et al.* (2002) had proposed the same explanation after conducting an empirical investigation of the effectiveness of contemporary managerial philosophies within hospitals, further noting that lack of efficacy and success regarding the implementation of QI initiatives is due to the historic confrontation between healthcare practitioners and new innovations that they deem to be inappropriate for the patient and care environment.

In summary then, healthcare practitioners are not only an input to the transformation output process, but they can also shape the transformation of the processes creating significant variability.

2.3.3 Resource management

Efficient administrative support and adequate resources are paramount for the outcome of the project (Grimshaw *et al.*, 2003, 2004; De Vos *et al.*, 2009). Lack of resource and the need to deliver more with less is a universal reality for managers in healthcare organisations. All healthcare systems (but especially publicly funded systems like the British NHS) must operate with often significant resource constraints. The need to match demand with existing and available capacity is clearly one of the most significant challenges that managers face in any service industry (Heskett, Sasser. and Schlesinger, 1997; Jack and Raturi, 2006). The balance of demand and capacity for hospital services is a multifaceted function of several variables and queues across the healthcare system. Maintaining a match between demand and capacity is key to a well-organized operation and flow of patients and it requires the support of, as well as coordination and collaboration within and between, hospital departments. Notwithstanding, the important role that resources have on the success of OM initiatives, resource variability and resource fragmentation have received limited attention in HOM literature.

A number of scholars have noted that legacy from rigid organisational structures; the ways in which professionals monitor processes and use of resources influences their collaboration and consequently, the outcome of the project (Brand *et al.*, 2005; Buchanan *et al.*, 2005; Stirman *et al.*, 2012; Hellström, Lifvergren and Quist, 2010). Drubsteen *et al.* (2016) studied operational antecedents of integrated cross-departmental planning and found that shared resources hinder the commitment of medical staff in care processes. Specifically, their study illustrates that organisational emphasis on resource utilisation and the particular performance requirements of the relevant departments creates a battle between the department which supplies the particular resource, (which is focussed on meeting its own performance targets), and the healthcare delivery departments' (customer) need for access to the resource. Professionals have the legacy of their knowledge and resource "ownership" to make decisions on how to allocate those, undermining process innovation. Similarly, in ORs literature, Elissen *et al.* (2011) found that scarce resources force practitioners to compete for them which consequently inhibits their ability to cooperate effectively, leading to variations in care practice.

Tucker *et al.* (2003) found that a lack of resource in terms of an appropriate organisational staffing model impacted the effectiveness and efficiency of workers. Specifically, the authors note that such a staffing model entails a situation where healthcare practitioners do not have the time to address and resolve the fundamental causes of problems that arise in daily activities. Indeed, practitioners are hardly able to keep up with compulsory tasks, and are thus required to quickly resolve any problems that arise so that they can fulfil their direct responsibilities. Consequently, in such cases practitioners may be working intensively and without respite, whilst providing little care for patients, and may be creating unnecessary steps or making clinical errors. In such circumstances, rather than eliminating expenses as desired, inadequate staffing resources add costs.

Moreover, the authors note that when operational failures occur, and time-pressured frontline employees choose a 'quick fix' instead of finding the root of the problem, this undermines system improvement. Particularly, this causes a resulting loss of information about operational failures that hinders system improvement efforts. Healthcare professionals' heavy workloads due to limited resources, eliminates their ability to learn from clinical mistakes and to resolve the underlying causes of problems that arise from their activities (Tucker and Edmondson, 2003; 2015). QI specialists note that it is important to allow staff to make improvements by providing them the time and space to contribute towards change (Tucker and Edmondson, 2003).

Literature on resilience in operations supports and adds to the claims above. Resilience is the capacity to endure and recuperate from challenges, pressure, or stressors (Alliger et al, 2015). Some researchers define resilience or flexibility as it is also called, as input for innovation (Van Gool et al, 2017). It is the capability of professionals and their teams to respond amenably in real time, rearranging resources and act such as to maintain operating despite unexpected variations, or outlying failures (Karuppan, Waldrum and Dunlap, 2016; Rankin et al, 2014). Samia, Siha and Saad (2008) note that resilience necessitates considering for the long-range impact, and not looking for, nor accepting only provisional solutions, or results that fade quickly as time goes by. When individuals and teams are not capable enough to overcome and adjust variations and unexpected events, research shows that collaboration outcome is negatively affected. Team members can lose their team spirit and become more idiosyncratic and self-focused (Alliger et al, 2015). This has a negative consequence on decision-making, coordination, and ultimately performance of the organisation (Gittel, 2008). Similarly, when teams face stressful situations, team members incline to become cautious about sharing their observations and suggestions for practice and improvement, which has led to harshly adverse performance outcomes (Alliger et al, 2015).

Some authors argue that professionals' training is a coping mechanism to staff shortage. Increased individual staff capacity through formal as well as informal training via multitasking, multi-skilling; shadowing, mentoring and united working can enable professionals to build their individual and team resilience skills (Rushmer and Pallis, 2003). Professionals will be able to advance wider expertise; enhance their knowledge for the role, services and skills of the professionals they are working with, develop a more complete perspective on individual and organisational issues they face in their work; support the development and implementation of new activities; support and cover each other. As Rusmher and Pllis (2008) explain "in this way one is constantly building the individual capacity of staff and, almost by default, the total overall organisational responsiveness to changing circumstances" (p.65). When professionals enhance their knowledge on how to adjust, cope with new working methods, then these are more motivated and willing to risk in sharing and working collaboratively (Rushmer and Pallis, 2003; Gittel, 2008; 2013). The importance of staff training for the routinisation of new processes will further be discussed in subjection below.

Although HOM literature provides useful insights for the adoption of OM initiatives, at macro and micro levels, there was insufficient literature explaining interactions between actors at these three levels, and how these interactions impact, or are impacted when OM initiatives are introduced to the organisation. However, OM initiatives, and in this case a

care pathway, is a multilevel initiative (designed externally, national bodies), implemented by the organisation (hospital managers) and performed by practitioners. Literature on ORs helps the researcher to make sense of, and better understand what impacts the adoption of OM initiatives, by analysing the initiative from multiple levels and exploring the interactions between these levels. Due to the interdependent nature of the healthcare processes understanding the interaction between all these levels is vital to be able to improve processes.

2.4 Insights from the ORs literature

This section provides the main insights from ORs literature into obstacles to successful OM process management initiatives in healthcare organisations. The literature on ORs emphasises the need to study pathway adoption and performance from multiple levels: interactions between professionals; interactions with the organisation; and broader environmental factors. Figure 2.4 illustrates the key insights that the researcher has drawn from ORs; with supporting evidence from HOM literature for the factors that impact the performance of input-process-output (IPO) model in healthcare settings.

At an interpersonal level, shared knowledge and the relational resources of professionals are vital to the outcome of their collaboration and subsequently, their willingness to accept a new initiative and contribute to its successful implementation. At an organisational level, hospital managers and the associated implementation strategy can guide and support collaborative behaviour by promoting the reflective practice amongst practitioners. This enables individuals to improve their performance, and also encourages collaboration. Providing a sound organisational support mechanism, such as training and education opportunities, and any necessary equipment is also important. These are inputs to the processes. ORs literature also highlights the role of artefacts, as an input to the process impacting collaboration, but which also shapes the practitioners' approaches to carrying out the process. Finally, at a broader organisational level, socio-political influences impact both the professional work as well the availability of resources.

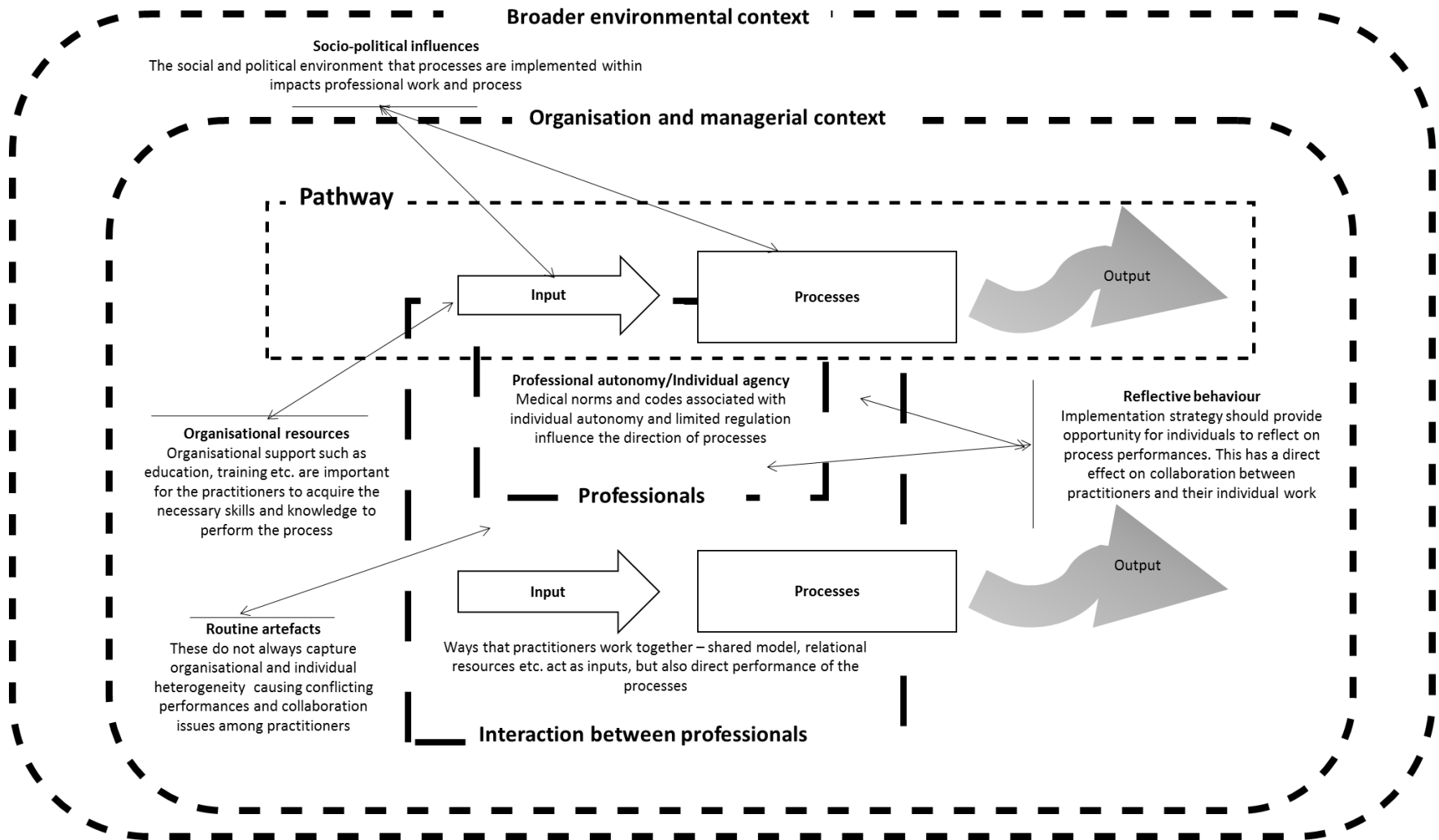


Figure 2.3: Configuration of IPO model with main insights from ORs supported from HOM literature

2.4.1 Interpersonal relationships

“Individuals act, but they do so in a context created by the actions of the other participants” (Pentland and Feldman, 2005). To practice routine, individuals need to work in a cooperative and integrated manner. Based on HOM and integration literature, internal integration is defined as the extent to which communication, coordination and teamwork exist within an organisation (Pagell *et al.*, 2015). Dobrzykowski *et al.* (2016) in their study highlight the important role of internal integration in facilitating communication, relationships and coordination among healthcare providers in improving hospital operational performance. The authors note internal integration “can unlock improved performance for PSOs” where outcomes are driven by interdependent professionals characterised by high degrees of autonomy and the need to share information to coordinate their work (Boone and Ganeshan, 2001; Apte and Goh, 2004; Dobrzykowski and Tarafdar, 2015; 2016).

Drawing from both coordination (Haque, 2010; Gittell, 2011), operations and information systems (IS) literature (Lee, 1997), an information exchange relationship is defined as an accurate, timely, adequate, and credible information interchange among actors involved in a routine. However, in healthcare organisations, coordination of information exchange is difficult to achieve due to the existing challenges of synchronising operational activities and information (Nembhard *et al.*, 2009). Some specific aspects of healthcare processes make information exchange between the healthcare practitioners challenging. Firstly, the flow and the content of the process of treating each patient is variable according to patient needs and characteristics. Although some processes, such as CT scans, can be relatively standardised, new tasks are evolved based on individual patients’ needs ((Malone and Crowston, 1994; Nembhard *et al.*, 2009). Secondly, multiple practitioners with varying knowledge and skills are involved in the process which makes accurate communication between them challenging (Nembhard *et al.*, 2009; Dobrzykowski and Tarafdar, 2015). Different parties will have different types and quality of information. Several studies have focuses on the work of information asymmetry in healthcare and its impact on the quality of care (Bloom, Standing and Lloyd, 2008; Barlie, Saviano and Polese, 2014). Evidence designates that due to the health information asymmetry the improvement of service co-creation in health industry is slow (Tung, 2009) and aids on co-creation in health care identify the relevance of information (Engström, 2012). For instance, Bloom et al (2008) identify that “asymmetries are seen to pervade health care markets, which are characterised by high levels of uncertainty. For example, patients may be able to describe their symptoms, but they have inadequate information to link their condition to a particular type of treatment or course of medication” (p.2077). This makes an uneven power of relationship between the doctors and

the patients and the former may exploit for their own interest. Similarly, managers do not have the medical knowledge that doctors have. Consequently doctors have more power in making decisions, which sometimes are conflicting with the interest of the hospital. Thirdly, activities take place in different locations and handoff between practitioners can be problematic, inducing considerable variations to the process. These situations comprise the knowledge intensive and complex nature of healthcare processes and create challenges around coordination and information exchange amongst practitioners (Chen, Preston and Xia, 2013; Dobrzykowski and Tarafdar, 2015).

The literature also highlights shared knowledge and relational resources as two main factors that support information exchange relationships and the coordination of healthcare processes, supporting the adoption of process management initiatives.

Incongruity of mental model of care

Incongruity between professionals' mental model of care, defined as disparity of professionals' understanding, knowledge and skills on healthcare practice, creates communication and coordination issues within processes (Den Hertog, 2000). Healthcare practitioners deal every day with the challenge of delivering value to patients despite time constraints and unexpected workload pressures, communication with the patients and relatives whilst being dependent on the work of other colleagues for information and supplies (Tucker and Edmondson, 2003). In such work settings, employees' knowledge constitutes the major driver in respect of coordinating their work and improving current practices (Den Hertog, 2000).

Professionals can and do interpret the ostensive component of a routine differently, resulting in processes that are not performed identically by all members of the organisation as originally designed (Pagell *et al.*, 2015). Because practitioners often undertake their tasks in different times and places, they may understand the actions of other practitioners within the process differently, because they have not necessarily seen those actions being performed. Individuals may only see the outcome of actions in artefactual form (i.e. software or patient, and thus, they may miss important information and consequently understand the routine differently. They may also have different understandings of what information is important to exchange and when. For instance, McKnight *et al.* (2002) found that physicians and nurses had different perceptions of what information is essential to communicate between them. This resulted in communication difficulties which led to differences in routine performances. In a study of outpatient surgeries, the authors found that medical errors were caused due to communication issues between practitioners involving reports, forms and oral exchanges

(Gurses and Carayon, 2007). Similarly, Unertl *et al.* (2006) in their study of workflow in an academic medical centre, found differences between the routines that people talked about, in terms of the routine artefacts (representations of routines) and their observations. They show that different participants held dissimilar ideas of how work happened in the clinics they observed (Unertl, Weinger and Johnson, 2006).

In another study, Zeelenberg *et al.* (2015) studied six different cases of acute care chains to gain a deeper understanding of inter-professional communication. Acute care is a division of secondary healthcare where patients with serious illness, episode or surgery receive active short-term treatment. This type of care is organised in care chains where multiple providers need to cooperate with the aim to deliver unified care to patients with acute care needs (Zeelenberg *et al.*, 2010). The authors found different types of communication failures such as inefficient feedback, and failures related to structure of handovers as well as an overall poor quality of handover communication. The authors illustrate that these were mainly caused by weaknesses in shared understandings of the communication routines on the level of the acute care chain. Evolutionary theories emphasise that in a world where individuals differ in their perceptions of the environment and where communication, acquisition of information and computation are essential, co-ordination can only be achieved with the development of common rules, language, and codes that are shared and well understood by all the care members involved in a given interaction (Cohendet and Llerena, 2003).

Research has shown that in knowledge-intensive service organisations, variations in professionals' mental model of care can be eliminated through knowledge sharing behaviour i.e. the communication of task-relevant ideas, information and suggestions with colleagues within their organisation (Srivastava *et al.*, 2006; Mura *et al.*, 2015). For instance, in their work Boone and Ganeshan (2001) show that departmental experience improves engineers' efficiency because service providers develop a common knowledge and skill set. This finding was further reinforced by the work of Dobrzykowski *et al.* (2016) who have shown that comprehensive lean strategy orientation can advance firm performance by supporting the development of shared understanding between healthcare professionals regarding how clinical pathways should be executed, which is important given the significant autonomy of healthcare professionals (Harvey, 1990; Goodale, Kuratko and Hornsby, 2008).

The capacity to accumulate, recombine and assemble knowledge stands as a vital condition for the creation, promotion and adoption of innovations at any level of analysis (Kogut and Zander, 1992; Murra *et al.*, 2015). Mura *et al.* (2015) in their work claim that individuals who are more actively engaged in knowledge sharing efforts show stronger innovative work behaviour in their job. When sharing knowledge, individuals assemble, explain, develop and

re-explain their ideas, information and proposals to fit receivers' benefits and understanding. These activities can be helpful to learn new ways to use and manage existing knowledge (Radaelli et al., 2014). Specifically, employees create and promote innovative ideas in their workplace by sharing best practices, mistakes and seeking feedbacks (i.e. share with their colleagues their mistakes, best and good practices such as getting their feedback on those etc.) which represent different occasions for the creation of innovative ideas (Mura et al, 2015).

Additionally, knowledge sharing efforts also signify cases for individuals to socially interact with their colleagues. Based on the social exchange theory, researchers note that individuals who engage in this social exchange with an anticipation that knowledge receivers would counter their effort in the future (Dirks and Ferrin, 2001; Chiu et al., 2006). By stimulating receivers' sense of gratitude, knowledge sharers can then be expected to receive more unique and valuable knowledge, which supports the development and creation of new ideas; to find more potential partners that would deliver practical support to idea promotion and implementation (Mura et al., 2015).

Although operations managers realise the importance of knowledge sharing for innovation, initiatives formulated to promote knowledge sharing often fail due to employees' indifference or aversion (Shah and Ward, 2007; Brennan, 2008).

Social capital

The social capital of professionals' supports shared knowledge and promotes inter-professional collaboration. Knowledge sharing is a risk-taking behaviour, which is rooted in social relations, and from which workers often disengage when they predict receivers' opportunistic behaviours (Siemsen et al., 2009; Yam and Chan, 2015).

The concept of social capital has been explored from different disciplinary perspectives, but this mostly originates from the field of sociology (Portes, 1998). Social capital as a concept has been used and defined differently from healthcare researchers. For example, Coleman (1988) notes that "social capital is defined by its function. It is not a single entity, but a variety of different entities with two elements in common: they all consist of some aspect of social structures, and they facilitate certain actions of actors — whether persons or corporate actors — within the structure. Like other forms of capital, social capital is productive, making possible the achievement of certain ends that in its absence would not be possible. . . . Unlike other forms of capital, social capital inheres in the structure of relations between actors and among actors. It is not lodged either in the actors themselves or in physical implements of production" (p. 98). While Putnam (1995) refers to the "social capital as features of social

organisation, such as trust, norms and networks, that can improve the efficiency of society by facilitating coordinated actions” (p. 167). These definitions agree on the idea which is also used for this thesis, that social capital is related to the social relationships among people or groups and the resources gained through these relationships. They signify the breadth and strength of the ties that link individuals in a social network, and carry out their tasks.

Mura *et al.* (2016) studied how employees in knowledge-intensive environments share knowledge, which is important for promoting innovative behaviour and improving organisational performance. They found that actors with greater social interaction are more likely to share knowledge (Crossan and Apaydin, 2010). Particularly, they explain that when individuals have stronger social ties, they have higher degrees of psychological safety to exchange information such as mistakes that may have been made, to seek feedback for their work or to ask questions. Sharing mistakes is associated with the promotion of new ideas, which encourage employees to explore changes that may improve their practice. Whilst seeking feedback is associated with improved implementation outcomes, since it exemplifies the social exchanges between employees that test the application of new ideas. Sharing mistakes and seeking feedback arise within a professional environment where employees feel psychological safety and have strong relational resources. Within such an environment where employees feel comfortable expressing and showing their limitations and weakness (Mura *et al.*, 2016). Moreover, the authors note that in professional environments where boundaries are highly guarded, stronger social ties reduce individuals’ opportunistic behaviours.

Likewise, Gittel *et al.* (2011) note that relational resources contribute to the efficiency of communications between healthcare practitioners. Haque *et al.* (2010) illustrated that when individuals have stronger relationships, they are more adept at exchanging information. Low quality relationships weaken communication (Baker, 2001; Haque, 2010; Gittel, 2011; Dobrzykowski and Tarafdar, 2015) as well as weakening the cooperation that is the other element of efficient and effective collaboration between professionals. Cooperation is defined as shared goals, interests and mutual respect between individuals (Gittel, 2011). When these assets of relationships exist, they empower people to work together (Feldman and Rafaeli, 2002; Haque, 2010; Gittel, 2011; Dobrzykowski and Tarafdar, 2015). Specifically, Feldman (2004) explains in this case, trust, authority, complementarities, and information are qualities of the relationships that influenced the way in which people were able to work together. For example, when participants do not share respect and the same goals, or when they feel that other professionals do not respect them, they tend to avoid exchanging information (Gittel, 2011). Conversely, when individuals share the same goals

they act in support of the goals of the whole process (Feldman, 2000; 2002; Becker, 2005; Gittell, 2011). Respect for the quality, and for the work of others, particularly inspires professionals to understand and value the contributions of other professionals and to reflect on their own actions and their impact. This web of relationships not only contributes to information exchanges, but is also influenced by the outcome of the communication process. Delay, inaccurate and less frequent information all impact upon the relationship between individuals.

Relational resources might take the form of networks or connections that increase understanding about both the skills, and the willingness, of other people to collaborate (Uzzi, 1997; Tang and Baker, 2000). Generally speaking a network can be defined as a unified group or system (Tang and Baker, 2000; Malby, 2014). Networks are established or evolve instinctively to enable the movement or exchange of resources or supplies. The relationship between network characteristics and operational success is well-demonstrated. Research has recommended that networks support healthcare improvement by providing an environment for experimentation and generating knowledge, exchanging information and dispensing good practice (Malby, 2014). A network can be defined as ‘a cooperative structure where unified groups or individuals merge around a shared purpose based on trust, respect, mutuality and reciprocity’ (Malby, 2014). Networks are able to build a community that promotes cooperation and trust between members, reassuring continuous engagement and commitment. In the report of Healthcare Foundation, (Malby, 2014) the authors studied the impact of social networks in driving quality improvement. The authors noted that interviewees described relationships between the employees as an important element to any improvement initiatives and strongly believed that this made them successful in driving change.

Innis *et al.* (2016) advocate that social networks within the organisation are considered as formal and informal methods that individuals can employ to communicate and exchange information. Scholars note that vigorous encouragement for organisational members to form social networks is known to be a driver of successful adoption of innovations/interventions (Innis *et al.*, 2016). Interaction between professionals correlates positively with co-operation between them. When individuals interact formally or informally they are more able to build personal and working relationships. Individuals can exchange information and develop shared understanding of what constitutes a routine, what actions they should take, when and how. Turner *et al.* (2012) note that these interactions between individuals, and the connections formed in the process of performing ORs, empower them to transfer and share information, both for the practice of routine but also in terms of information that it

contributes to the development of mutual understanding and agreement regarding the performative aspect of routines; this had an impact on both the stability and compliance of ORs. The actors come together to perform the routine, create relationships that facilitate growth of their common understanding of the goals, objectives and actions that should take in specific instances of the routine.

Likewise, Greenhalgh *et al.* (2008) showed that successful routines depended on collaborative interactions between staff. They argue that friendship and reciprocity is developed through meetings over time, and that it can enable individuals to cross routine professional and organisational boundaries over time. This idea is also supported by the work of Dittrich *et al.* (2016) in which the authors study how interaction, and particularly talk amongst individuals, shapes and leads to changes in routine. They explain that the ability of individuals to interact formally or informally allows them to collectively reflect on routine performances. Individuals have the ability to share and discuss their concerns, issues and difficulties regarding the process and suggest improvement options and this plays a crucial role in creating stability or changes to routine as needed. Other researchers have also emphasised that group level reflection on routines is a crucial factor in routine change because it fosters learning and the articulation of knowledge (Edmondson, Bohmer and Pisano, 2001; Lazaric, 2008). Edmondson *et al.* (2001, p. 705), in their study of cardiac surgery departments, emphasised how “group-level reflection” taking place “through formal meetings, informal conversation, and shared review of relevant data” contributed to the implementation of changes to the operating-room teamwork. Similarly, Feldman (2003, p.730) described how routine participants engaged in “a series of meetings to try to understand why the change was not taking place and how to bring it about.” In some way, all these instances of talk about routines can be interpreted as a form of interaction amongst the individuals which empowers them to collectively work out how to set up new – or modify existing – routines and develop a shared model. In general, all of these studies offer evidence that professional interactions, the development of shared understanding about the routine and social capital can be resources for routine performance (LeBaron *et al.*, 2016).

2.4.2 Interaction between the professionals and organisation

Interaction between professionals and the organisation plays a vital role in the ability of multiple professionals to develop common knowledge and shape routine performances (Feldman, 2000; Tsoukas and Chia, 2002; Essén, 2008).

The high levels of specialisation –and consequently autonomy – found in healthcare settings have consequences for organisational and managerial structure. This can influence the coordination of routines and create chaotic situations (Edmondson, Bohmer and Pisano, 2001; Greenhalgh *et al.*, 2008). A controlled and structured professional environment discourages a culture of flexibility where individuals are encouraged to collaborate but, also to work efficiently independently (Joosten, Bongers and Janssen, 2009; de Souza and Pidd, 2011a). Specifically, Edmondson *et al.* (2001) illustrate how differences in terms of position, authority, and power may influence routine performances through the decisions of participants as to whether to engage in talk and collective reflection upon their performances. Haque (2010) notes that there was a lack of mutual respect between groups. For instance, the author notes that if a patient needed assistance to go to the bathroom, the doctor would not help with such a task, but would ask a nurse to deal with it. In other studies nurses were found to be reluctant to express their opinions during consultations or ward rounds which meant physicians were not in possession of essential information about patients (Tucker, Heisler and Janisse, 2014). Tucker *et al.* (2007) studied operational failures and tested a frontline system improvement in US hospital nursing units. They found that creating an environment where employees feel equally qualified to discuss operational failures contributes positively to collaboration and consequently, to healthcare outcomes.

Research emphasised the role that good leadership, strategic vision, managerial relations, organisationally committed and competent staff have in routinisation of innovations (Zahra and George, 2002; Greenhalgh *et al.*, 2008). Good leadership can produce a rising sense of personal innovativeness among users and their agency, can help to dispel and even reverse negative perceptions of a new system by inspiring and encouraging the professionals to implement the new routine practices (Goh, Gao and Agarwal, 2011). Dorbrzykowski *et al.* (2016) argue that hospital leaders should drive a comprehensive process initiative orientation covering quality management principles and patient focussed care. The implication is that hospital managers should equip healthcare practitioners to improve processes – eliminating waste and adapting to change – in a setting where consideration and understanding of patient needs and the goal of providing high-quality personal care are overriding factors (Lettieri, Shani and Longoni, 2012). ‘Good’ leadership for organisational managers entails fostering a culture of routine reflection, through the provision of sufficient organisational resources (i.e. actual physical resources, artefacts and equipment, training and education opportunities).

Reflective behaviour

Supporting reflective behaviour in professionals, individually or collectively, should be a fundamental element of any process initiative orientation. Both ORs (Leape *et al.*, 2009; Innis and Berta, 2016) and OM scholars (Tucker, 2007; Grove *et al.*, 2010; Ponsignon, Maull and Smart, 2014) have shown that organisations who encourage and support reflective behaviour of participants, either formally, or informally, are associated with better routine performances (Feldman, 2000; Edmondson, Bohmer and Pisano, 2001; Dittrich, Guérard and Seidl, 2016). As explained above, individuals either solely or amongst themselves, evaluate the outcomes of their actions in routine performances, compare with ideals and previous plans, introduce new ideals and apply changes accordingly in the next iteration of the routine, changing the form of the ostensive aspect (Pentland and Feldman, 2005). Focusing on the micro level of actions, the reflective behaviour of routine participants and the practice-based perspective on routines (Parmigiani and Howard-Grenville, 2011; Feldman *et al.*, 2016) scholars have tried to understand and capture the factors that influence and guide behaviour. Research has found that organisations that encourage and support opportunities for reflective talk amongst professionals improve their routine performances. Talking in this context can be seen as the coordinating mechanism of the routine, since it enables individuals to reflect collectively on routine performances; develop social capital and consequently, promote shared knowledge. Conversely limitations on talk can delay or stop routine change altogether (Edmondson *et al.*, 2001). Weick (1993) observed that when individuals do not talk in the face of a troublesome event, this failure to talk can result in a fatal breakdown of a routine. Additionally, Zeelenberg *et al.* (2015) identify inefficient feedback routines as a key barrier to implementation of an innovation within hospital acute chains.

HOM scholars have also noted that well developed performance monitoring systems are significant drivers for any process management initiative (Dionne S. Kringos *et al.*, 2015). For example, Hellstrom *et al.* (2010b) studied the implementation of a management initiative of manufacturing industry origins within a Swedish hospital. They found that a weak performance monitoring system was responsible for the subsequent implementation failure: Practitioners were not provided with evaluation mechanisms, and they were consequently unable to evaluate their actions and assess the impact of the new process. Consequently, they were not cognisant of resultant improvements to the process, causing a subsequent lack of trust in the process and their own actions. Similarly, Boyer *et al.* (2012) explain that an active organisational level emphasis on evaluating progress on the implementation of innovation and safety measures supports successful implementation. Rewarding and motivating staff

through the provision of feedback on performance, and efforts at communicating these mechanisms and rewards across the healthcare organisation is a proven driver of successful process improvement initiatives (Grove *et al.*, 2010; Al-Balushi *et al.*, 2014).

Differences in individuals' personal values also present significant challenges to the definition and development of effective quality and customer value measures (Nembhard *et al.*, 2009). In comparison to other industries, defining 'customer value' is more complex in healthcare systems (Young and McClean, 2008, p. 162) since stakeholders include government agencies, insurance agencies, charities and, in addition to patients themselves, their families as well. All of these may be considered 'customers' yet may have very different expectations as to the values of the service, and consequently it is challenging to identify the customer and the multiple types of value, in order to meet the project driver of value defined by the customer (Grove *et al.*, 2010). For example, hospital managers define 'quality' as the provision of efficient and cost-effective services, while clinicians often define 'quality' as time spent with patients developing relationships to influence patient outcomes. ORs scholars also refer to heterogeneity in targets, goals and objectives as an outcome of the presence of multiple routine participants, and one that has a considerable impact on routine performances. Defining customer value and quality of care is important for the development and identification of clear targets and goals of the project (Fillingham, 2007; Grove *et al.*, 2010; Al-Balushi *et al.*, 2014). Poor performance measurement, and poorly thought out targets can be harmful and destructive to the organisation (Young and McClean, 2008) as well as disadvantageous to patient health (Colvin, Eisen and Gong, 2016).

Additionally, encouragement and involvement of employees in project activities (i.e. design and evaluation of the improvement process and facilitation of the necessary resources) promotes reflective behaviour in employees, and aids the adoption of process management initiatives. Higher levels of commitment amongst employees to process improvement initiatives has a corresponding effect on development of their trust in the system making them more amenable to innovations (Löfgren *et al.*, 2012). Lack of understanding amongst employees as to the principles and targets underlying an innovation can deliver poor or perverse outcomes (Bevan and Hood, 2006). In their later study, Tucker *et al.* (2015) show that involving employees in project activities provides more insights to managers on how to design, what to improve and why to improve the process to achieve the desired outcome of tangible improvement. Frontline employees have in-depth knowledge about process issues and operational failures, and are an important resource in identifying which problems should be selected for resolution efforts (Banker, Field and Sinha, 2001; Field and Sinha, 2005).

Organisational resources

The level of resources dedicated to the implementation of routines alongside ongoing operations, including money, training and education, physical space, and time have a direct impact on their outcome (Edmondson, Bohmer and Pisano, 2001; Hurwitz, Greenhalgh and Skultans, 2004; Damschroder *et al.*, 2009; Dewar and Mackay, 2010). Encouraging employee involvement in project activities is shown to be best achieved through provision of education and training events. Making a patient safety culture such as continuous support of training, provision of well-defined policies is associated with positive influence on the implementation of innovations (Sehwail and Deyong, 2003; Griffiths *et al.*, 2009; Glasgow, Scott-Caziewell and Kaboli, 2010). For example, Sehwail *et al.* (2003) and Legare *et al.* (2011) noted that a major challenge of project implementation was the dearth of management provision of training and support to practitioners resulting in gaps in their understanding of, and consequently, their practice of the improvement project. In their study Lifvegren *et al.* (2010) describe a project where participating employees and managers undertook a three-day training programme on the concepts and methods of Six Sigma. This approach not only continuously cascaded knowledge of improvement processes throughout the organisation, but was subsequently adopted locally as a learning process developed around every project in support of other improvement activities in the clinic. These findings are also supported by Al-Baloushi *et al.* (2014) who argue that, to successfully implement an innovation, continuous training and education of employees in the principles of the projects and their practical applications is essential. As well as already mentioned above, research on resilience has also shown that training becomes vital by product of integrated working. This supports the co-operation in working relationship of participants (Rushmer and Pallis, 2003).

Routine artefacts

‘Routine artefacts’ as routines scholars call them, also have an essential role to play in the development and application of processes (D’Adderio, 2001, 2008; 2011; Pentland and Feldman, 2005; 2011; Aroles and McLean, 2016). Routine artefacts are embedded rules and procedures of the routines in protocols, guidelines, software and other artefactual forms (Pentland and Feldman, 2008). Despite the importance of process representation and associated documents in the performance of processes, there is little HOM literature focussed on them. Artefacts have an impact on both the workflow and the way that individuals communicate within it.

Routines scholars have also attempted to understand stability and change in routines through examination of the socio materiality of agency and ideas of materiality (D’Adderio, 2008;

2011; Novak *et al.*, 2012; Aroles and McLean, 2016). Van Raak *et al.* (2008) observed that, due to a lack of coverage of specific steps within a protocol, paramedics practiced differently creating communication issues among them. When artefacts are implemented in a professional setting, the tendency of individuals to act autonomously impacts their use. Edmondson *et al.* (2001) showed that new technologies implemented in routines had a negative impact on the work of physicians that, consequently, raised their resistance to using them. Goh *et al.* (2011) found that through healthcare information technology (HIT) implementation, daily routines were disturbed causing physicians to resist using it effectively. Similarly, in HOM literature Hellstrom *et al.* (2010a), noted that respondents claimed that administrative systems and the information technology structure at the hospital were built upon different logic, which inhibited their ability to pursue the aims of the improvement initiative.

Unique individual characteristics such as education, prior knowledge and performance experience influence the way that practitioners use artefacts. If practitioners do not realise that the other actors in the routine use artefacts differently, this can result in completely contradictory documentation of steps during the routine, resulting in clinical errors. Hayes *et al.* (2011) and Novak *et al.* (2012) studied the implementation of a routine artefact, HIT, in a hospital. Hayes *et al.* (2011) found that based on their years of training and knowledge about medicine, physicians decide differently on how to use HIT systems. While Novak *et al.* (2012) argue that when new technological artefacts are implemented in an organisation, practitioners tend to bring their past experiences with other technologies to the performances of routines which can cause misalignment of routine performances between practitioners.

Scholars of knowledge management have sought to better comprehend whether, artefacts, viewed as-the codification and organisation of knowledge through documents, databases, patents, manuals, etc., promote and facilitate knowledge sharing (Wang and Noe, 2010). Extant literature shows that there is a positive relationship between codified knowledge and knowledge sharing. The authors note that codification of knowledge facilitates knowledge-sharing since it removes the “stickiness” that tacit knowledge always transmits with itself. Codifying knowledge (i.e. ideas, information, etc.) in artefacts enables information to be more easily accessed and shared by others (Ancori, Bureth and Cohendet, 2000). Nonetheless, there is still no clear evidence regarding the relationship of routine artefacts with shared knowledge within an organisation. Scholars argue that there is a need to provide clear evidence and justification for the role of codified knowledge in complex settings, where tacit knowledge is leading and often difficult to codify in objects (Sternberg, 1999).

Routine scholars argue that “artefacts-centred assumptions about design are not well suited

to design ORs” (Pentland and Feldman, 2008). Guidelines and protocols are most frequently developed and used by experts in the field, and they are used by people with varying levels of expertise (Patel, Arocha and Kaufman, 2001). This means that they may not be well written and may fail to be well understood and communicated by all users (Essén, 2008; Feldman and Pentland, 2008; Bruns, 2009; Haque, 2010; D’Adderio, 2011). D’Adderio (2011) explains that the ability of artefact designers to capture “the micro dynamics by which formal routines as inscriptions are brought to life” is a crucial element in making sense of routines in practice. Once implanted in artefacts, skills, intensions and individuals’ knowledge (D’Adderio, 2001), become more stable (D’Adderio, 2008). Hayes *et al.* (2011) note that there are continuous inherent conflicts between the autonomy and improvisational tendencies of physicians, and the need for regulation and preservation of patient safety. This conflict may cause development of alternative pathways of routine practice that may damage the organisation. The authors note that designers of artefacts should be careful to capture such tensions within their study of routine, and within designs of artefacts.

Chao (2016) recognise that alongside strong professional autonomy within healthcare settings, which makes standardisation of routines difficult, designers of routine artefacts should consider the demand for flexibility in healthcare practices and the need to adapt to regular unpredictable patient census and agency. The uncertainty and variability of practices is also important to record. Chao (2016) notes that the attempts by individuals to achieve standardisation of practice by way of embedding work routines in an electronic health records (EHR) system, to align individual practices with institutional guidelines, failed. To address the failure of designers to capture individuals’ heterogeneity in the design of routine artefacts, Pentland *et al.* (2008) proposed a method of ‘narrative network’² that would empower individuals to capture the reality of routines, both ostensive and performative aspects. Following their idea, a number of authors applied this method to the study ORs in different settings (Hayes *et al.*, 2011; Constantinides and Barrett, 2012; Chao, 2016). Examining routines and how information and documentation are used within them, allows the researcher to develop a more robust understanding of how to build routines and prevent errors.

² Narrative Networks similarly to a workflow diagram, is a method that represents sequences of events, but instead of viewing one version of a process, it can show a range of possibilities (Hayes *et al.* 2011). Rather than presenting a single account or view of routines, NN presents multiple views from different stakeholders, enabling the representation of the holistic performative aspect of routine in practice (Hayes *et al.* 2011).

2.4.3 Broader environmental factors

Broader contextual environmental factors, such as the regulatory system within which a care pathway is implemented, are also influential in determining the success of the initiative. There is limited OM literature that studies the impact of socio-political factors on the adoption of OM initiatives. However, these factors are important, especially for OM initiatives that are designed for introduction to the organisation by national bodies. An initiative is more likely to be implemented if it is designed and supported by political dynamics, socio-political climate (Greenhalgh *et al.*, 2008) and incentives. Governmental bodies apply pressure on healthcare organisations to provide better care using less resources. They develop targets and rules, introduced to the organisations, but which may not be compatible with organisational capabilities, potentially causing variation to their practice and consequently, resulting in lower quality delivery of care. Alternatively, these rules and targets may be in conflict with already existing routines and targets set within the organisation (Greenhalgh *et al.*, 2008; van Raak *et al.*, 2008). These targets sometimes produce negative effects on the practice of the initiative, and consequently, on patients. Governmental bodies place an additional layer of pressure on the work of practitioners, influencing quality of care. For instance, Lofgren *et al.* (2012) argue that national guidelines that introduced time-limit requirements hindered the implementation of a project. Governmental targets also “limit employees’ choice of action” as well as creating collaboration issues between practitioners. For instance, these targets may force practitioners to compete over scarce resources and to develop different goals and targets related to quality of care. Similarly, Grove *et al.* (2010) estimate that, in the setting within which they conducted their study, there were three hundred governmental targets to be met by hospital managers (Klein, 2007). Grove *et al.* (2010) note that targets result in ‘gaming’, – the manipulation of data to report good outcomes while hiding real performance – as identified in their study.

2.5 Towards a conceptual framework

Distinctive features of the healthcare context and the nature of medical work challenge the adoption of management practices. Between the competing stakeholders involved in the operations’ management of organisation’s processes (government, organisation, professionals) there are organisational, functional, geographic, temporal, identity-related and many other boundaries that are spanned and which need to be effectively bridged in the design, implementation and acceptance process of OM initiatives and the course of patient care. However, there is limited HOM literature that examines how we can understand the management and adoption of such OM process management initiatives from multiple levels,

yet this is crucial for their adoption and improvement (Pentland and Hærem 2015). Concentrating on actions rather than actors, different levels of analysis and how these themselves interact, challenging process adoption is essential (Pentland and Hærem, 2011). A similar approach can be applied to understanding variation and change in the context of OM initiatives, with the difference that the focus of enquiry is placed upon actions rather than actors (Pentland and Hærem, 2011).

In particular, for interest of this study, the need for a multi-level analysis of the clinical care pathway also stems from the terminology of the concept itself. Examining the clinical care pathway as a routine introduced to the organisation to span the boundaries in the work of healthcare professionals, calls for an attention to the micro-dynamics that can explain change. A care pathway is a process on its own, but one that is implemented within the hospital, - an organisational hierarchical phenomenon – to improve quality and efficiency. Consequently, the main focus of attention rests on the organisational context. While understanding clinical care pathways as national protocols reflects the national sets of priorities and the need to consider the environmental/governmental levels to understand change.

The nature of medical work - uncontrollable uncertainty in patients' needs and demand (Gittell *et al.*, 2000; Nembhard *et al.*, 2009; Tucker, 2009) - challenges the adoption and effectiveness of those processes. This decreases the potential for healthcare organisations to plan resources and manage processes to match capacity and demand (Tucker and Spear, 2006; Grove *et al.*, 2010).

Local managerial and organisational factors can also influence the adoption of OM initiatives. Managers may fail to effectively develop – plan and control – the implementation of these. Inability of managers to understand the organisation, the existing processes and associated dependencies to develop an implementation strategy and adopt relevant coordination mechanisms can harm adoption outcomes (Malone *et al.*, 1999). Difficulties for managers in understanding both the organisation and the projects themselves can lead to sub-optimal design of performance measurement systems, which can also impact implementations and improvements to processes. Developing a sound performance measurement system is a substantial contributory factor for the success of every QI approach. The essentiality of evaluating routines' performances and of sharing the results with practitioners, enabling individual and collective reflection must be understood. ORs authors note that both individual and collective reflection of employees through formal and informal interaction, can lead to change and improvement of routine performances (Edmondson *et al.*, 2001; Dittrich *et al.*, 2016). Both managers and employees have the

opportunity to identify limitations, set targets and goals and work towards improvement accordingly. Additionally, managers may fail to successfully communicate the implementation strategy with the employees further damaging the adoption process (Greenhalgh, 2008; Al-Balushi *et al.*, 2014; Ponsignon, Maull and Smart, 2014; Tucker and Singer, 2015). Having a suitable and effective measurement and reward system to monitor progress is fundamental for improvement of the system (Grove *et al.*, 2010; Al-Balushi *et al.*, 2014).

Furthermore, organisational support, availability of resources, technological support, as well as physical design and the workforce into which a routine is introduced can influence performances. These variables can facilitate or restrict practitioners in the delivery of their tasks. Extant HOM literature has made limited investigations into resource variability and resource fragmentation and these are important factors to consider.

The infrastructure of the organisation impacts the communication and co-operation methods of individuals and, unavoidably, the development of their relational resources, which are essential for positive outcomes for collaborations (Hellström, Åslund and Nielsen, 2010; Agarwal *et al.*, 2016). While both HOM and ORs scholars recognise that geographical boundaries of routines have an impact on their performances, there is limited explanation of the specifics of these impacts.

Physical representations of processes (i.e. protocols, scripts, process diagrams etc.) also exercise significant impact on process adoption. Despite the significance of process representation and associated documents in the performance of processes, HOM literature is sparse in this area. ORs scholars point to the insufficiency of development by management staff of effective routine artefacts for routine performances (D'Adderio, 2008; Pentland and Feldman, 2008). The inability of managers and/or designers to capture the reality of routines can create unwanted variation. Designers of artefacts may fail to capture the reality of routines – heterogeneity of individual characteristics such as intensions, knowledge and experience (Pentland and Feldman, 2008; Hayes, Lee and Dourish, 2011) and thus, artefacts may be used in unintended ways. Such issues can create variations in routine performances and lead to medical errors (Novak *et al.*, 2012).

Since healthcare delivery is a professional service industry, it is characterised by other features that should be considered. Care processes constitute interactions between multiple clinical practitioners, and efficient and effective collaboration between these professionals is fundamental to the successful adoption of improvement initiatives. These practitioners have high levels of knowledge-based specialisation. Scholars from both HOM and ORs literatures note that due to these high levels of knowledge specialisation healthcare

professionals tend to work autonomously creating variability in the way that care is delivered. This hinders collaboration between practitioners (Tucker, 2004; Grove *et al.*, 2010; Hellström, Åslund and Nielsen, 2010). Medical norms of professionals, well-known characteristics of the healthcare industry can also explain their resistance to adopt new practices. For many practitioners, implementation of an innovation appears inconsistent with their occupational norms: “make a habit of two things, to help or at least do not harm” (Hippocrates, 400B.C.). Thus, when healthcare organisations try to implement process initiatives, professionals have the power to resist them. Such differences of opinion with regard to ethical norms present barriers to collaboration between practitioners and introduce considerable variation into routine performances, impacting negatively on the successful adoption initiative.

Furthermore, high levels of knowledge specialisation create a strong hierarchical organisational structure within healthcare settings, with differences in professionals’ roles, creating a set of power dynamics that impact negatively on collaboration between practitioners. This also colours interactions between practitioners and managers. Unlike many other industries, most healthcare managers do not have the professional knowledge, experience and qualifications of their workers (Proudlove *et al.*, 2008) which makes it unusually difficult for them to plan and control such improvement initiatives. However, the impacts of the professionalisation of healthcare services has begun to be investigated in HOM literature, and it needs to be explored further to better understand, design, implement and improve processes.

Social capital and the relational resources of participants such as shared goals, interests and mutual respect are another important factor worthy of consideration. If these relational assets do not exist practitioners may fail to work together (Dobrzykowski and Tarafdar, 2015; Feldman and Rafaeli, 2002; Gittell, 2011; Gurses *et al.*, 2006; Haque, 2010) leading to implementation difficulties. When individuals do not share the same goals, they tend to act autonomously and without regard for the wider process they work within (Becker, 2005; Feldman and Rafaeli, 2002; Gittell, 2011). A resultant lack of appreciation for the quality, and value and contributions of fellow practitioners is a further source of conflict among them that begets unwillingness to work together. Furthermore, practitioners who do not share respect for their colleagues do not consider the impact of their actions on the work of the others which can lead to negative outcomes in routine performances (Gittell, 2011).

Finally, QI projects/initiatives are embedded within organisations that are contextualised by the wider environmental factors, such as socio-political drivers. Financial constraints, governmental targets and rules embedded in the organisation by governmental bodies

directly shape the way that actors perform routines (Greenhalgh *et al.*, 2008). Moreover, the initiatives themselves may impose targets on the organisation that do not match either the capabilities of the organisation or the pre-existing working patterns of individuals, creating outcomes contrary to the aims of the process initiative. Figure 2.5 illustrates the main insights drawn from HOM literature for the factors that impact the performance of IPO model in healthcare settings.

2.6 Conclusion

The literature review reveals a need to look more carefully at OM initiative adoption within healthcare settings. This thesis utilises both HOM and ORs literature to investigate the “black box” of clinical care pathway adoption – a process management OM initiative - and to extend existing understanding of the principles of process improvement in this context. The literature in these two areas is associated, but the merger of these two streams has not been carried out to date. Although OM has succeeded as a field, there is yet still much to be learned regarding the adoption of process management approaches and as to how this knowledge base can be successfully applied within healthcare organisations. By reviewing the literature of HOM and ORs together, researchers can explain more about the challenges faced in the adoption of OM process management approaches in healthcare settings than they can by looking at the two fields in isolation. Greenhalgh *et al.* (2008) acknowledges that although routines theory yields fundamental insights into variations in care practice, these “have yet to be systematically applied to this particular approach” (Greenhalgh *et al.*, 2008, p. 1270). By integrating intuitions and concepts from both fields, we can use them in empirical studies of practitioners in order to determine what to study. The findings from these studies can be used to design superior approaches and to ease their adoption. Both bodies of literature share many common themes that support the decision to examine and evaluate these two fields as a basis for the investigation of adoption of clinical care pathways.

OM QI initiatives (in this case a stroke care pathway) are initiatives directed and designed by internal (organisation itself) or external (governmental, public etc.) authorities. These are then introduced to organisations with the aim of enhancing processes to deliver services/products in a more effective and efficient manner. Organisations make a planning and control for the implementation of these initiatives which professionals should then accept. Through individual and collective interactions, employees deliver these initiatives and subsequently enhance their own professional capabilities to achieve improvement. Looking at the different levels at which OM initiatives are generated, introduced and delivered, via the interactions and day-to-day work of healthcare systems provides a unique opportunity to better explore the relative paucity of successful adoptions. We can then better

understand what triggers divergence from the theoretical ideals of the processes, the implications of these divergences and assess methods by which to address them.

Summarising, the aim of this research is to revisit and extend a core OM theme, the process of standardising work, by exploring the implications for this process (intended to increase efficiency and effectiveness) in an atypically (for OM) complex and knowledge intensive setting, by studying its adoption from two different levels: the Hospital and professionals. Specifically, the work address two related RQs:

1. What, if any, are the distinctive characteristics of standard professional/judgement (healthcare) work?
2. What are the challenges associated with implementation of standard work in a professional (healthcare) operations setting?

In the next chapter, the researcher discusses the research methodology and methods employed to address these questions.

Broader environmental context

Socio-political influences
The social and political environment that processes are implemented within impacts professional work and process inputs

Organisation and managerial context

Organisational resources
Organisational support such as education, training etc. are important for the practitioners to acquire the necessary skills and knowledge to perform the

Shared Resources
When these are shared among multiple other groups this challenges the effectiveness and efficiency of the processes

Routine artefacts
These do not always capture organisational and individual heterogeneity causing conflicting performances and collaboration issues among practitioners

Pathway

Input

Processes

Output

Nature of medical work
High level of uncertainty in patient outcomes and demand impact both processes and outcomes

Professionals are inputs to the processes but due to specialised knowledge, medical norms and codes associated with individual autonomy and limited regulation influences the direction of

Professionals

Reflective behaviour
Implementation strategy should provide opportunity for individuals to reflect on process performances. This has a direct effect on collaboration between practitioners and their individual work

Input

Processes

Output

The way that different professionals work between them – shared model, relational resources etc. act both as an input but also direct performance of the processes

Interaction between professionals

Figure 2.4: Conceptual Theoretical Framework of the study – Configuration of IPO model with main insights from HOM& ORs literatures

3 Methodology

“Research is best conceived as the process of arriving at dependable solutions to problems through the planned and systematic collection, analysis, and interpretation of data” (Mouly, 1978)

The above quote highlights the important role that the choice of an appropriate methodology plays in any research project. Following the presentation of the conceptual model in Chapter 2, in this chapter the research methodology of this study is explained and justified, along with the methods adopted for the research questions to be answered and the research objectives achieved. To this end, the adoption of a pragmatic paradigm and a mixed method approach are defended, in accordance with the research strategy that has been selected. This chapter outlines and justifies the suitability of the mixed method approach for exploring the research questions that were refined by the literature review.

The starting point of the chapter is an outline of the most significant philosophical approaches to research positions, which precedes a brief discussion of the research approach and strategy. Following on from this comes a delineation of choice of setting, access in the field, data collection methods and analysis, discussion and an ensuing exploration of the reliability and validity of the research is presented. The chapter concludes with a summary.

3.1 Research Paradigm

This section considers the research paradigm and the subsequent choices made for this study. All researchers must locate their work within a chosen research paradigm. In the relevant literature ‘paradigm’, has been understood in multiple ways. A ‘research paradigm’ or ‘philosophy’ as it is often called is defined as a ‘basic set of beliefs that guides actions’ (Guba, 1990). These are the foundational assumptions that direct the research process. A paradigm provides a framework into which research facts and ideas can be organised and assessed (Mackenzie and House, 1978) and it will influence the choice of research question and methodology (Morgan, 2007).

Morgan (2007) attempted to summarise all divergent definitions of ‘paradigm’ and categorise them into four layers (Figure 3.1) that treat paradigms as shared belief systems that impact the types of knowledge researchers pursue and how they understand the evidence they collect. What differentiates these four versions is the level of generalisation of that belief system. According to Morgan (2007) the broadest definition of paradigm is the ‘worldviews’. ‘Worldviews’ comprise ontological beliefs that researchers hold about the

nature of reality and the external world. The key division within worldviews centres on a belief in the objective versus subjective nature of reality (Morgan, 2007). On one hand objectivists believe that social objects exist independently from people, thus the nature of the world exists independently of how individuals may experience it (Bryman, 2008). On the other hand, constructivists believe that social objects are constructed through the actions that people practice.

The second layer of paradigms is related to epistemology, which describes how we know what we know, and represents only one part of our view of the world. As such, it is concerned with the nature of knowledge. Finally, the third and fourth layers of paradigm represent the shared beliefs among researchers in each area of specialisation, about which questions are most meaningful and which procedures are most appropriate for answering those questions. And the ‘best practice’ methods and research practices,

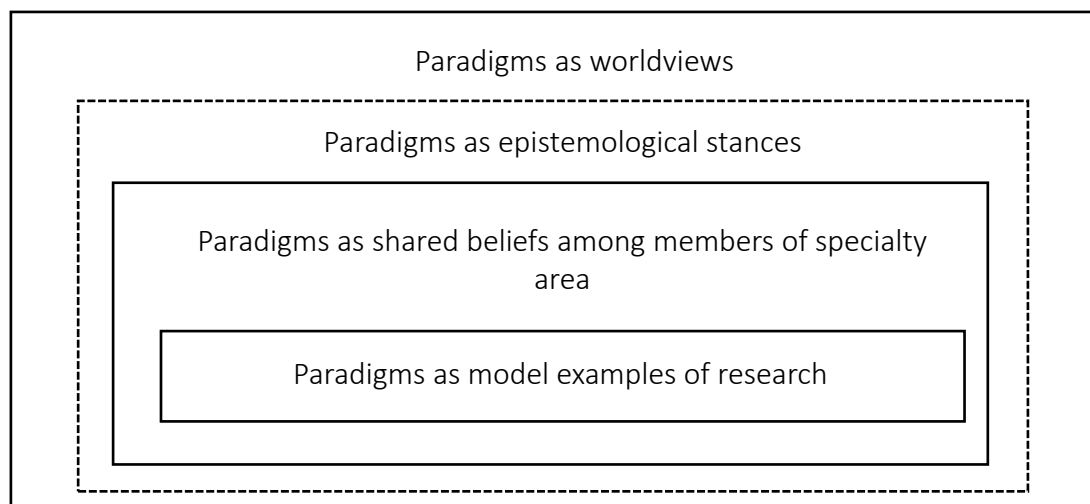


Figure 3.1: Morgan’s examples of research paradigms

The most common epistemological paradigms in social science are the two extremes – positivism, and social constructivism/interpretivism – while critical realism sits between the two. Social sciences are frequently described as ‘pre-paradigmatic’, in contrast to the mature sciences such as mathematics, physics and chemistry (Kuhn, 1970). Since researchers in the field of management differ in respect of preferred research approaches and apply different paradigms, it is therefore important to review these paradigms and perspectives in order to appreciate the background and assumptions of these philosophies. Below, the three research paradigms used in social science are briefly described with a final subsection that justifies the philosophical choices for this study. Table 3.1 summarises the key points and highlights the differences between the three research paradigms.

Main paradigms of management research			
	Positivism	Critical realism	Interpretivism
Ontological beliefs	Social world is external and objective regardless of individual understanding	Social world is external and objective regardless of individual understanding but, it is impossible to capture knowledge perfectly	Local and specific constructed realities. Reality is created internally through the actors
What is reality?	There is only a single truth Findings are true	Findings are probably true	There is no ultimate truth. There are multiple realities and different interpretations of different situations during the study Findings are created
How can I know reality?	Uses artificial study environment	Uses both natural and artificial study environments	Uses natural study environment
Sample size	Large study samples	-	Small study samples
What technique/methods do I use to go and find out reality?	Quantitative methods of study: experiments, statistics, simulations, surveys, questionnaires etc.	Mixed methods- Quantitative & Qualitative methods of study: experiments, survey, case study,	Qualitative methods of study: field research and interviews

Table 3.1: Features of the main paradigms in management research

3.1.1 Positivism

This philosophy is mainly found in physical sciences and assumes that there is only one reality and seeks to identify causal relationships through objective measurement and quantitative analytical approach (Firestone, 1987). Positivists assume that there is an existing external world and that genuine knowledge of it is based on observation. Research adopting this perspective is considered independent and unbiased due to use of larger samples to test carefully constructed hypothesis by using methods such as experiments, questionnaires or surveys which physically remove researchers from the subject of study. Historically, positivism was the main research approach followed by healthcare researchers, and this was based on the necessity for the researcher to be objective and unbiased. However, the positivist perspective has been heavily criticised for being too simplistic and for ignoring key differences in the culture, values, perceptions, context and socio-historical complexities that contribute to human behaviour (Khun, 1970).

3.1.2 Interpretivism

At the other end of the spectrum, social constructivism/interpretivism was developed primarily in response to the application of positivism to the social sciences (Easterby-Smith,

Thorpe and Lowe 2002). Proponents of this perspective suggest that there are multiple realities and thus different interpretations may be valid in different situations during the study (Appleton and King, 2002). They argue that reality is mainly a social construction and is created internally through the actors (Bryman 2008). Constructivists study the context of human experience in a detailed process and try to describe that reality (Matthews, 2002). They argue that there is no ultimate truth and are concerned with human interpretation of meaning perceived in phenomena and actions, rather than the actions themselves. In contrast to the positivists, social constructivists are subjective and tend to study smaller samples (Matthews 2002). They use a qualitative analytical approach, methods such as field research and interviews, which site them close to the subjects of study.

3.1.3 Critical realism

Traditionally, advocates from the ‘incompatibility thesis’ argue that these two different perspectives, positivism and interpretivism and their analytical approaches are different and should remain completely separate (Gage, 1989). However, in recent decades a hybrid epistemological approach - ‘critical-realism’ or ‘post-positivism’ – has emerged. This perspective lies between the two extremes, positivism and interpretivism, and can be understood as the philosophical perspective that a mind-independent reality exists, which has its own intrinsic order (Morgan, 2007). Within the context of the ontological, ‘world views’ paradigm advocates of critical realism argue that knowledge is qualified by both historical and social conditions (Mingers, 1997). This notion implies that although social structures and mechanisms may be real, there are important differences between the actual events, produced by such structures and mechanisms and the way that these events are observed and experienced by individuals. Kwan and Tsang (2001) argue that realists believe in the “possibility of progress towards a true account of phenomena”, theories, methods, observations all have limitations since reality is independent from our minds (p.1165). The authors also state that any verification or falsification is never definite, particularly in the field of social science (p.1165). Particularly, advocates of this paradigm suggest that the deliberate combination of quantitative and qualitative approaches is possible and should be encouraged. They propose that all the methods have limitations, and that biases inherent in any single method will be counteracted by adoption of a mixed approach. Accordingly, a mixed method methodological approach is capable of bridging the gap between the quantitative and qualitative positions (Johnson and Onwuegbuzie, 2004)

In recent decades, it has been proposed by numerous mixed-methods researchers, that pragmatism or/and mixed methods may be the third epistemological paradigm (Teddlie and Tashakkori 2003). Teddlie *et al.* (2003) present the link between the pragmatist and mixed method approaches in five points: (1) The primary focus is the research question, while research methods and paradigms are of secondary consequence, (2) qualitative and quantitative research can be combined within one research project, (3) there is no division between positivism and constructivism, instead both points of view can be accommodated (4) the research question guides the choice of the research methods (mixed, qualitative or quantitative), (5) Neither approach highlights the metaphysical concepts (truth and reality) and, finally (6) they are both practical and applied.

3.1.4 Philosophical choices for this study

Based on the aforementioned reasons, for this research, a critical realism paradigm was adopted. Epistemologically, the researchers highlight the significance of their interactive relation with the participants and the impact of social and historical factors that influence them. They adopt a critical realism epistemology, believing that reality is not only what we can see, but there is a reality independent from human minds. In terms of ontology, the researchers believe in a subjectivist/interpretivist ontology which implies that individuals apply their knowledge to events and phenomena and that this impacts the way that they experience them. A mixed method approach provides the researcher with a better understanding of the quality of service and delivery process within the study setting. In order to investigate the adoption of the clinical care pathway in healthcare organisations, multiple interviews and observations of the process, allow the researchers to capture different perspectives that may not be taken by responses in a survey. Thus, this study considers the subjective element of individual perspectives.

3.2 Research approach

Before deciding and describing the methodological choices for this study, the research approach and processes should be first introduced. There are two main methodological approaches described in the literature – inductive and deductive. Inductive reasoning follows an interpretivist philosophy and it is mainly based on qualitative research; begins with observations and findings and generates theory from the regularities and observed patterns (Bryman, 2008). Deductive reasoning follows a positivist philosophy and it is mainly based on quantitative research and is used to assess/test pre-existing theory with the aim to generate new knowledge (Bryman, 2008). If there is a clear definition of the phenomenon of study

and existing theories provide correlations, relationships or hypothesis that can be tested then deductive research approach may be appropriate. In contrast, if the phenomenon of study is not well defined and the research aims in developing theory, then an inductive approach is more applicable.

However, the research approach needs not necessarily fall strictly into one approach or the other, since it is possible to include elements of both approaches. This has been recognised as a third research approach, called abstractive (Mingers, 2001; Dubois and Gadde, 2002). For example, theory may guide research into the capture of observations and in turn from these observations new theories may be developed. Usually research on inter- and intra-organisational relationships combines both approaches. Therefore, the process for this study should be considered a combination of an iterative learning process that brings together an inductive and deductive approach. In a way, the empirical fieldwork that is conducted in this research follows the theoretical conceptualisations provided in this study. Specifically, this research is interested in the endogenous and exogenous pressures that influence the implementation process of clinical care pathways. The logic of abduction is that the research process shuttles between practice and theories developing an interlacing discussion between the existing theories and empirical findings.

3.2.1 Research strategy

A research strategy is assumed as the general direction that researchers choose to conduct their research (Bryman, 2001). There are two main, broad level research strategies: quantitative and qualitative. Usually these two strategies sit within the philosophical approaches. Quantitative research strategy tends to test theories and lies within the objectivist ontology and positivist epistemology. While Qualitative research strategy often creates theories, and is located within a constructivist ontology and interpretivist epistemology. A number of academics support a third research strategy that combines, both qualitative and quantitative strategies. They argue that deterministic relations between epistemological positions and research strategies are deceptive (Mingers 2001).

In order to focus the research project, it is important to reflect on its purpose, the nature of the research question and the research strategy (Marshall, 1996). Table 3.2 below provides a brief explanation of the existing research strategies with both the advantages and disadvantages of each. The order assigned to the strategies has no particular meaning.

Strategy	Description	Advantages	Disadvantages
Survey	Quantitative research method that is mainly employed to test theory. It uses large sample sizes to avoid biases. Data is usually collected through emails, telephone, face to face or via internet.	Can investigate relationships and due to the use of large sample it can create generalisability	It is unable to reflect the complexity of individual beliefs. There are also issues regarding the interpretation of the questions.
Archival Research	Either quantitative or qualitative research method	It allows the exploration of an issue from the past and can consider change over time	Controversial findings/ It might not provide the correct information since the documents that are analysed have not been developed with the study in mind
Experiment	Quantitative research method usually, used in natural sciences. Requires control and change/management of specific variables. Data is collected in an artificial or natural environment	Can recognise causality	Difficulty in managing/manipulating some of the variables. Therefore, it is not an efficient method to be used for all the research questions
Grounded Theory	Qualitative research method that is strictly used to generate theory.	It is highly exploratory and can provide deep insights to the research questions.	Difficulty in identifying if there is already existing theory, when the researcher initiates the study
Ethnography	Qualitative research method that mainly involves participant observations. It aims at generating theory and lasts for a sustained period (Longitudinal)	If the researcher manages to gain the trust of participants then, this method can provide deep insights	Difficulty in generalising the data and findings
Case Study	Qualitative research method that creates theory. Data is usually collected via multiple methods – observations, interviews and document analysis. Can include a single or multiple case.	It provides profound insights and reflects the complexity of individual beliefs	It usually involves small sample and there is high subjectivity of the data. Unsuitable for statistical analysis and thus for generalisation of the data.
Action Research	Qualitative research method typically a collaboration between the organisation of study and the researcher. It is an iterative research approach	It is an active form of research that recruits change	It may take long time to be completed Lack of repeatability and rigour

Table 3.2: Research Strategies

Taking the above into consideration and in order to achieve the objectives of the inquiry, the researcher decided to undertake a mixed method case study. The ability of mixed methods to meet practical needs for evaluating and understanding the complexity of healthcare service delivery has recently been recognised and used extensively by healthcare researchers (Curry et al., 2013). Researchers suggest that mixed methods studies can effectively detect

the “experiences, emotions, and motivations of people providing and receiving health care, as well as the objective conditions of care delivery” (Pope, van Royen and Baker, 2002; Maxcy, 2003).

Case study

The use of the case study method is appropriate when the context is important (Yin, 2014). The value of case studies has been recognised in healthcare research, and the number of researchers undertaking case studies is gradually increasing (Baker, 2011). Healthcare practice is a complex social phenomenon, and case studies offer methods to develop better understanding of the role of the organisational and micro-system contexts (cases) for improving quality of care (Baker, 2011). Thomas (2011, p. 513) describes case studies as “analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more methods”. The case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytical frame — an object — within which the study is conducted and which the case illuminates and explicates. Undertaking a case study for this research enabled us to understand the implicit aspects of routine and its component parts. Moreover, using multiple methods and having several different sources, allowed for data triangulation helping to answer different types of questions.

This case study is an explanatory case study used to further understanding and develop causal explanations for social phenomena (Schwandt, 1997; McNabb, 2010). In these studies, the research recognises a specific social phenomenon and tries to identify the characteristics (i.e. economic, social, climate, practice or an event in the social environment) that might be causal and can explain the consequence of interest (McNabb, 2010). Applied to this study, variation of care practice is an important social phenomenon to investigate, especially in regard to identifying causal explanations for variations.

3.3 Case study selection

This study is focused on acute stroke care. Each year in the UK an estimated 125,000 people have a stroke and 40,000 of them die (Finegold, Asaria and Francis, 2013). The Department of Health’s National Stroke Strategy for England identified that timely treatment of patients and specialist care within a stroke unit are the main factors that can improve the outcomes of patients after suffering a stroke. It has subsequently recommended major changes in the management of stroke care (Party, 2012). One critical change is the implementation of clinical pathways within hospitals (Gil Nunez and Mora, 2004; Olsen *et al.*, 2003; Kaye *et al.*, 2010). As stroke is one of the leading cause of mortality not only in the UK but

worldwide (World Healthcare Organisation, 2015), need for stroke care will increase. Thus, understanding the factors that prevent the successful implementation of this QI initiative can help serve both medical teams and the hospital in which they practice.

Additionally, it is important to study stroke care for the following methodological and theoretical reasons:

1. The acute stroke care pathway, as process improvement initiative has been implemented in the hospital of study.
2. Stroke patient is relatively inactive in the process. Low variability in patient behaviour allows the researcher to capture variability factors related to systems and processes. All the patients observed began and completed the pathway, which was an important factor to consider given the time constraints of the data collection period.
3. The acute stroke care pathway consists of several subroutines based on function, space, time and organisational arrangements which converge while caring for stroke patients. This facilitates study of ORs across different organisational boundaries and better investigation of the research questions.
4. Acute stroke care pathway is relatively short in duration, allowing the researcher to repeatedly observe routines from the beginning to the end.
5. Availability of secondary data, the opportunity for the researcher to be present during care delivery and the existing recognition of the need to explore issues with the delivery of care.

3.3.1 Access in the field

As previously stated, this research is jointly funded by the University of Bath and the hospital of study. This facilitated easy access to the research environment. Before entering the hospital and initiating data collection, the researcher completed an ethics application form and received approval from the Hospital's Research and Development team. Additionally, the process to obtain an honorary contract with the hospital and thus become a member of the staff was followed. The researcher attended a two-day induction programme and had the required vaccinations. She was honoured with the title of Research Assistant and given access cards with name and photo (as per all Hospital staff). These cards were the researcher's passport to the hospital. As well as providing access to all the areas of the hospital, they ensured that the researcher, and hospital staff, felt that she was part of the hospital team. The researcher was allocated a desk, in the Business and Intelligence Unit of

the hospital, where she was able to work, when not collecting data, and this provided separation from the study participants.

The Hospital partners were very supportive in terms of providing opportunities to network with the hospital staff and identifying the right people to assist with data collection. Initially, the researcher was introduced to a stroke consultant who then introduced her to the remaining members of the stroke team. The researcher initially faced some difficulties in obtaining the trust and acceptance of the staff, but this did not last long. After a number of visits to the department, making a sustained effort to socialise with the staff; spending time with them during coffee and lunch breaks, and attending social activities, staff became more receptive and began to ask more questions about the researcher and her work. Soon if the researcher was absent for a few days, staff would notice and enquire if all was well, and eventually, after completion of the data collection phase, whenever the researcher visited, the department staff would share news of what had been happening in the unit.

As already mentioned above, being an inside researcher to the setting of study and having insights from the lived experience can cause bias issues to the research. In order to avoid going 'native' and ensure the objectivity as researcher, different approaches were followed. Objectivity in a case study refers to reliability, excluding the notion of consistency (Stewart, 1998). Objectivity has three dimensions: repetition, bias and specification, concerning which, the latter two are addressed. Regarding this study, the full journey of the researcher, from the beginning to its conclusion has been recorded, including the thoughts and experiences of the researchers as an observer. Feedback from other researchers, such as academic supervisors and other academic colleagues, were employed to avoid any inclination of the researcher to drift towards her own biased opinions or adopting those of her informants.

Moreover, the researcher presented her study model and interpretations to the relevant practitioners every time a new interview phase was taking place. This enabled her to avoid any personal opinion and keep in line with their interpretations.

Another strategy used to make sure the explanations were consistent with the reality of the participants' views, was to routinely discuss temporary interpretations - at various stages of the analysis - with the hospital partners for feedback and ultimately present the final model to the hospital partners, the participants and the supervisors.

3.3.2 Data collection methods

The overall research design took the form of a mixed method case study, during an eleven-month period, from March 2015 to February 2016. The researcher made extensive use of

qualitative and quantitative research methods to learn about the acute stroke care pathway, the subroutines involved in it, and to collect data for both the ostensive and performative aspects of those.

The researcher combined semi-structured interviews in three different phases, analysis of archival documents, non-participant observations, and follow-up focus group. The data collection process was consisted from five different phases. Figure 3.2 provides an overview of the strategy that was employed.

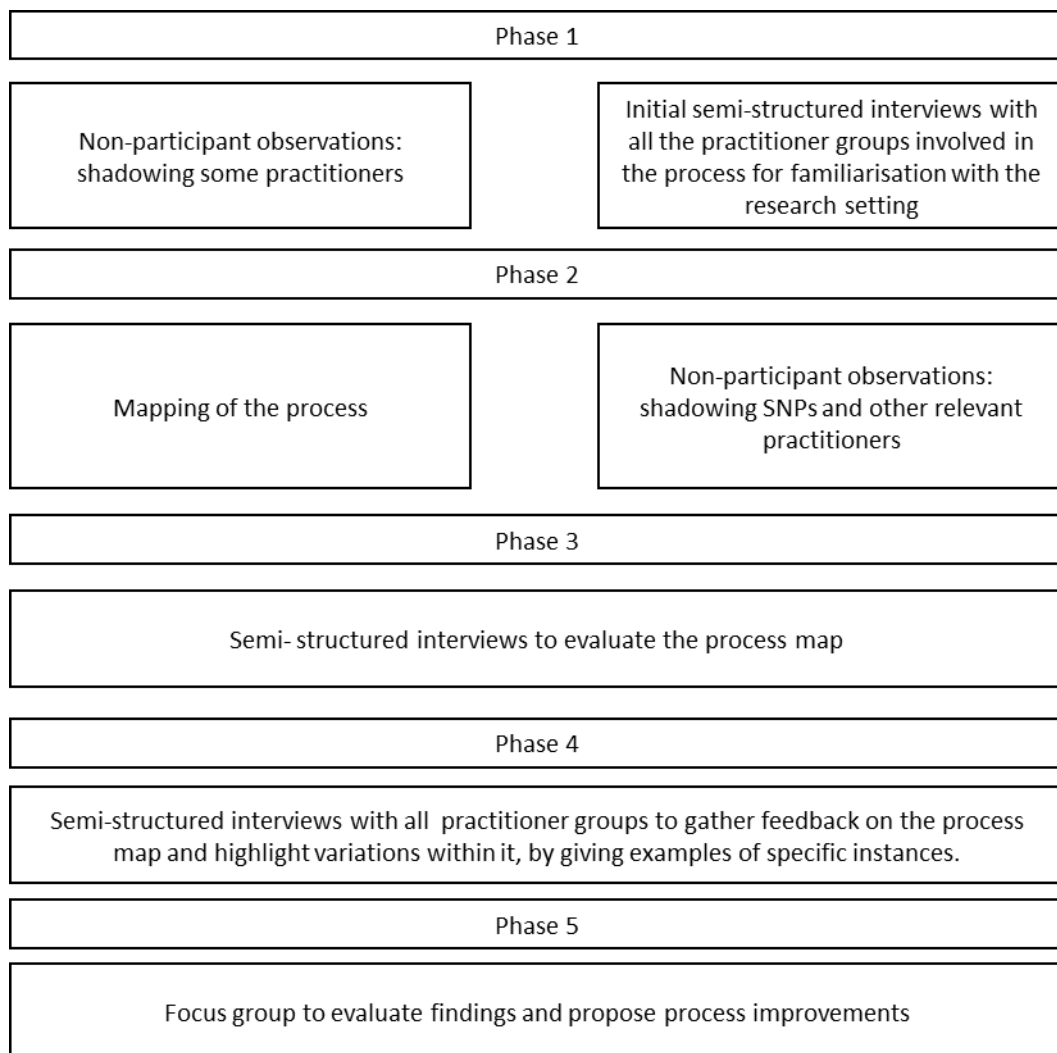


Figure 3.2: An overview of the strategy followed for the data collection process

Ostensive aspect of the process

To collect data for the ostensive aspect of the care pathway a modified Sequential Incident Technique (SIT) interview framework was used, consisting of three phases. The SIT has been used in the literature to explore quality issues in the processes of various services (Stauss and Weinlich, 1997; Chell, 1998). The technique focuses on the order that the events take place and tries to unravel irregularities, limitations and bottlenecks associated with the process (Stauss and Weinlich, 1997)

Familiarization of the researcher with the situated process and environment

In the first phase the researcher conducted fifteen semi-structured interviews with relevant staff in order to understand the existing stroke care process and the role of everyone in it. The interviews, which lasted 30-45 minutes each on average, were loosely structured using a topic guide that covered: ideal stroke care process, causal factors of stroke care process variation, and finally suggestions for improvement options (Appendix C). All interviews were recorded and then transcribed at end of the day or, at the latest, the following day. The researcher felt that transcribing the interviews as soon as practicable allowed her to remember and report any details that she was unable to write down at the time of the interview.

In addition to the interviews, the researcher collected data relating to the ostensive aspect of the process by analysing several formal and informal process documents provided by hospital staff. Data collected from the non-participant observations (described in more details below) were also used to inform the ostensive aspect of the process.

Mapping the process

In the second phase, the researcher combined all of the collected data and developed a first draft of a detailed process map. The researcher used a horizontal swim lane. This is a visual element used in process flow flowchart that visually differentiates job sharing and tasks for sub-processes of a business process (Madison, 2005). The researcher followed this up by conducting eight interviews with relevant stroke care staff to evaluate this process map.

Although process map is an important and traditional element of process improvements, it has some disadvantages.

1. Lack of details: It provides little data concerning ownership, relationship between the employees etc.
2. Handoffs: Handoffs occur when accountability for the process passes from one person to another. The swim lanes on a process map show us where that takes place, but this

does not provide us with enough information. But, in fact, this is where many issues appear in the process. Information exchange is a vital point of process performance and in case of an issue, the next stage or the whole process (sometimes) can be affected.

3. Information flow: The process diagram shows the sequence of activities. But often it is more informative to see the information flows that the process activates. Process map lags in the ability to illustrate information interdependencies that are vital to the outcome of the process.

In order to accommodate these issues, the researcher used other data collection methods such as interviews and observations to get more insights regarding the experience of pathway adoption in the particular setting, understand how care is delivered (i.e. information flow, relationships etc.) and identify factors that impact the process outcome.

In depth-interviews

Once the researcher had developed the diagram, the last interview phase took place. This method meant that observations of the process from multiple perspectives could be captured for both ostensive and performative aspects. The researcher conducted 19 interviews in this phase, walking through the process maps with the stroke care staff, noting any stated variations to it, and the main causal factors and issues behind variations. The researcher also asked them to detail specific incidents where possible, and it was observed that it was indeed easier for the participants to refer to specific incidents that cause variation to the process once they had the map in front of them. Table 3.3 outlines the interviews by role conducted in each phase. Some of the practitioners were not involved in the first and second phase of the interview. The explanation to this decision was partly due to lack of staff availability. Although some efforts to conduct some of the staff were made, these were not successful, but only at the final process. Moreover, the information that each participant was able to provide for the design of the process map was considered. For example, the members of the radiology departments had a partial involvement in the process and were not aware of what was happening after and before their tasks in the process. Relevant information regarding their tasks was captured from the observations and interviews with the other practitioners before those were conducted (without hurting the process map design). Thus, the researcher, after a consultation with the supervisors, thought that would not be a limitation to the data collection if those members were not included, but only at the final interview phase were variations of the process discussed.

Interview phases			
Role of the participant	Phase 1: Familiarisation with the process	Phase 2: Evaluation of the map	Phase 3: In-depth interviews
	Hospital Department		
Acute Stroke Unit			
Senior doctor	2	2	3
Nurse	2	-	2
HA (Healthcare assistant)	1		
SNP	3	3	3
Clerk	-	-	1
Therapist	4	-	
Emergency Department			
ED doctor	1	2	2
ED nurse	1	-	3
Maintainer	1	1	
EDA (Emergency Department assistant)	-	-	2
Radiology Department			
Radiographer	-	-	1
Radiologist	-	-	2
Total	15	8	19

Table 3.3: Interviews conducted during the field study

Performative aspect

In order to collect data for the performative aspect of the process the researcher conducted non-participant observations.

Conducting Observations

Upon first arriving at the hospital, the researcher was unsure of where to focus her research, and of and where to spend most of her time. To begin with, general observations were made of all the professional groups based in the Acute Stroke Unit (ASU). However, it soon became apparent that it would be very difficult to observe the whole care process and practice of each professional within the timescale available for the study. Consequently, the researcher narrowed observations to a specific part of the care pathway. Following observation of the whole stroke care pathway, and discussions with several practitioners and after determining where it would be possible to make observations, the researcher decided to focus on the acute stroke care pathway, from the time of patients' arrival in the Emergency Department (ED) to the patients' admission to the ASU. Five intersected subroutines, were

identified for observation; pre-hospital arrival, patient's ED admission, radiology department (CT scan test), ED decision-making and admission to ASU.

According to the clinical and hospital guidelines, this process should happen within four hours, allowing time to observe the whole (or at least most of) the process undertaken for each patient and thus, opportunity to collect sufficient amounts of data for the study.

An additional reason to focus on this part of the pathway was the involvement of the stroke nurse practitioners (SNPs). SNPs are specialist stroke care practitioners responsible for coordinating and facilitating the pathway of patients from the time of their arrival in ED until admission to the ASU. Given that SNPs were the main facilitators of the whole acute stroke care pathway for each patient, shadowing them presented an opportunity to follow the time critical admissions process of each patient from beginning to end. Shadowing the SNPs offered open access to all the relevant departments of the acute stroke care process and thus opportunities to recognise any cross-departmental issues that caused continuous variations in the practice of the process. Moreover, the fact that the researcher was accompanying the SNPs, (who would usually explain the presence of the researcher) made other hospital practitioners more amenable to sharing potentially important information with the researcher. The SNP role was a new quality intervention at the hospital and was provided every day from 9am to 9pm on weekdays and from 8am to 5pm on weekends. It is important to note that, at the time that this research was conducted, there were only three SNPs available, and thus the researcher could spend a lot of time with each of them. Consequently, close relationships were developed.

Initially, the researcher was stationed at the ED waiting for a stroke patient to arrive. However, due to the uncertainty of incidences of stroke care patient arrivals in terms of numbers and regularity, it was not a practical or efficient approach. Sometimes after six hours, or even the whole day spent in the ED, no patients would have arrived. Thus, after discussing with the SNPs, ASU and ED doctors' practitioners agreed to contact the researcher every time an ED patient arrived, by sending an SMS message. However, it quickly became apparent that this method was not working. Sometimes upon visiting the hospital to reinforce the relationships with the busy SNPs, the researcher would discover that patients had already arrived, and that SNPs had forgotten to inform the researcher. Alternatively, the researcher would receive notification of a patient arrival, but by the time that she arrived at the place of assessment, the care pathway would already be in progress, with the researcher having missed important parts of it. Consequently, the researcher finally decided to follow the SNPs from the beginning of the day until they left the hospital. Although this method required significantly more time, it facilitated the observation of every

patient that came in and even allowed for important issues (discussed in the next chapter) of care practice before or after patient arrival to be noted.

Generally, the researcher arrived at the hospital at 8:00 or 8:30am staying until 6 or 7pm. As noted above, the SNPs usually finished at 9pm and sometimes the researcher would observe them until then. In terms of daily routine, the researcher would visit her desk to deposit her belongings, then, immediately took her notebook and went to the ASU. There, the researcher would meet the SNP on duty and let her know that she would follow her for the day. During the observations, the researcher recorded everything that she noticed and anything that she felt may be important. Every process for each patient that was assessed by SNPs was recorded, each patient process was numbered, and each day's processes were recorded in a separate file – simplifying comparisons between daily variations between processes. A sample of the notes can be found in the Appendix.

However, it is important to note that it was not possible to follow all stages of the care pathway for stroke patients admitted to the hospital within a single day, since the researcher predominantly followed the SNPs. The SNPs were unable to participate in all stages of the stroke care process for every patient, either because they were dealing with the care of other patients or carrying out administrative tasks. Where the researcher was unable to directly observe stages of the process, the practitioners were interviewed to collect data. In all, 52 instances of patients following the acute stroke care pathway were documented. Table A.2. in the Appendix shows a descriptive analysis of the stages observed for which data was collected by interviewing appropriate practitioners, for each patient. While, Table 3.4 shows the number of instances for each of the stages, direct observations were made by the researcher and for those for which data were collected from interviews with the practitioners involved.

	Acute stroke care pathway stages				
Data collection method	Patient pre-arrival	Patient's ED admission	Brain Imaging	Patient's ED medical assessment and decision making	Patient's admission to ASU
Number of instances observed by the researcher	40	45	8	45	12
Number of instances data collected from interviewing staff	12	7	44	7	40
Total	52	52	52	52	52

Table 3.4: Number of instances for each stage of the acute stroke care pathway, directly observed and from data collected from interviewing staff.

Additionally, there were occasions when no SNP was available in the hospital. In those instances, the researcher would follow ED consultants if possible, but, when this became problematic for ethical reasons, the researcher would work from her desk in the hospital.

A master Microsoft Excel file was also used to record the hours and days that care process was observed. At the end of each day, or at the latest, the following day, the researcher would spend four or five hours at her desk, typing up all the observations of the day in Microsoft Word documents. To maintain the integrity of the data, and to ensure that any potentially important information that may not have been possible to record in the notebook during observations, the researcher endeavoured to complete typing up of data within one day of that observation. All documents were saved in a file in a password protected laptop hard drive and also to an encrypted portable hard drive provided by the hospital.

At the outset of the field observations, given the researcher's unfamiliarity with medicine, every detail was documented. Gradually, upon becoming more familiar with the care process and the practitioners, it became possible to effectively structure observations in order to better understand any variation in the practice of the process. Studying a range of archival documents provided by practitioners also enabled the researcher to develop her understanding of the process and the role of each practitioner in it.

In total 192.5 hours of observations of care practice delivered by the stroke care practitioners were conducted. These covered a range of times and days of the week; 133.5 hours' weekdays and 51 hours' weekends. Of these hours, 20 hours were spent in meetings, and generally observing the care practice on wards and the ED. These meetings included RD and ASU meetings regarding performance improvement, and evaluation of the brain imaging service (explained in the next chapter). The remaining 172.5 hours were spent observing

tasks associated with the acute stroke care pathway. Table 3.5 provides a summary time spent in the field.

Category	Hours
Patient care	172.5
Administrative observations	20
Total	192.5

Table 3.5: Time in the field (March 2015-January 2016)

Field observations took place across several locations, including the ED, the ASU, the radiology department (RD) and the emergency medical assessment unit MAU. These are the main departments that the acute stroke care process take place. The researcher was recording everything that was happening the time that care process for the patients was carried out. Shadowing the SNPs but also spending some time alone at each department allowed the researcher to observe various practitioner roles within the care environment. Table 3.6 outlines the areas and the practitioners encountered there.

Area	Roles observed
Emergency Department	SNP, ED staff, paramedics, bed managers
Acute Stroke Unit	Stroke nurses, stroke doctors, junior doctors, therapists, healthcare assistants
Radiology Department	Radiographers

Table 3.6: Areas of Observation and roles within each area

In addition to recording observations, the researcher went back and forth between the data and the literature. Upon first entering the field, it was expected that ORs literature would be significant, but the researcher also actively and pragmatically examined the care process throughout the observations. This took the form of weekly reviews of data gathered, and notes taken regarding any aspects of the process – for example patterns – that were of potential significance, in readiness for later investigation.

After around eleven months of observations, the researcher concluded that rather than recording new aspects of the care pathway, different variations of the same problems were being repeated. Consequently, the researcher believed that a saturation point had been reached regarding observations (Punch, 2013). As Punch (2013) note, continual observations from this point would have been unlikely to yield new insights into the data but, rather, further observations would likely provide more data fitting the existing patterns.

Focus group Interview

After concluding the non-participant observations and interview stages of the data collection process, the Hospital partners requested that the researcher present the findings of the

observations to the practitioners, as the researcher had previously suggested. During the data collection phase, the researcher had felt that presenting the findings to the practitioners who had worked hard to support and assist the researcher in her work would be a fitting way to thank them. Thus, in cooperation with the hospital partners, the researcher planned a workshop called *“Cake and coffee over a discussion for current issues and possible improvement of the acute stroke care pathway”* that took place at the end of May 2016 at the hospital of study. Attendees were invited from all units of the stroke care pathway observed, as well as the hospital management team. Although the workshop was not initially planned to be part of the data collection process, the researcher decided to include it since it could potentially provide more useful insights into the process. Consequently, the researcher provided a consent form to the workshop participants requesting permission use any data gathered at the workshop if needed. The attendance of 16 people in total comprised: 9 members of ASU (3 consultants, 3 SNPs, 2 registered nurses and 1 occupational therapist), 7 members of the top management team (head of general medicine, manager of ASU, 3 project managers and the manager of the business intelligence unit). The whole workshop lasted one and a half hours, beginning with a 30-minute presentation outlining the background, methodology and findings of the study, and followed by an informal discussion between the researcher and the participants for around an hour. During this discussion, the researcher was asked by the participants to clarify and explain some of the findings, and suggestions and ideas for improvement were discussed.

3.3.3 Data analysis

Analysis of the ostensive aspect of the process

The ideal theoretical design of the process is known as the ostensive aspect. As detailed above, in order to collect data for the ostensive aspect of the acute stroke care pathway, interviews were conducted with practitioners and further data was gathered through non-participant observations, and attendance at clinical and general staff meetings. The researcher then consulted a range of documentation, considering policies and procedures; hospital archival documents given to her by practitioners. Undertaking these steps, the purpose was to unfold the social situations, the activities, the places, the actors and the role as involved in the process (Spradley, 1980). For this, the researcher denoted to the nine descriptive questions suggested in the work of Spradley’s (1980) that form the basis of each social situation, which in this study is the adoption of acute stroke care pathway:

1. What are the physical places involved?
2. What are the objects in play?

3. What are the acts/the single action that creatives do?
4. What are the set of related acts that participants do?
5. What are the set of larger patterns of related activities that participants undertake? What are the actions/events?
6. What are the sequences of events?
7. Who are the other actors, involved in the process of acute stroke care pathway adoption (i.e. practitioners, managers etc.)?
8. What are the main goals? What do practitioners try to achieve?
9. What are the feelings, opinions expressed from the study participants?

The researcher tried to identify the relationship between these elements. For instance, the relationship between the activities and the actors or the events and places. This analysis helped the researcher to understand the role of each practitioner in the process, and to develop a sense of how the stroke care routine fitted within the wider context of the organisation. To these ends, during meetings and observations, the researcher asked clarifying questions as needed.

After deciding upon the focus of the study and the practicalities of observations scripts and process maps were developed for the ostensive aspect of the process as a whole and for the sub-processes involved in it. In the third phase of the data collection process, the researcher validated the process map (ostensive aspect of the process) through consultation with the practitioners themselves - 5 interviews were conducted. After amending the process map in light of those five interviews, the process map was used to guide practitioners in the fourth phase of the data collection process, which enabled the researcher to further test its reliability.

Analysis of the performative aspect of the process

After documenting the ostensive aspect of the acute care process as described above, the researcher consulted the resultant process map as a guide to the process observations. The researcher shadowed practitioners as they practiced their work, avoiding any personal contact with patients, and without practicing any part of the care process. These observations enabled the researcher to better understand how the different practitioners worked in practice, both individually and as a team. During the observations, particular attention was focussed on understanding fundamental issues and causal factors that impacted the ability of practitioners to practice routines according to the ostensive protocol.

Coding

Analysis of the collected data began in parallel with the collection process. Given the expectation of large amounts of data being collected, a decision was made to spend 1-2 days every two weeks analysing all of the data thus far collected. Initially two coding schemes were developed, with the aim of answering one main question:

Is there any difference between the ostensive and performative aspect of acute stroke care pathway?

- a. If yes, what is the difference?*
- b. What are the factors that cause it?*

The coding schemes were developed with reference to the OM and ORs literature, which was prominent in the researcher's mind during process observations. The researcher searched in the data for emergent causal factors of pathway variation, such as the patterns of behaviour, artefacts, information exchange, and knowledge sharing and formed the constituents of the pathway adoption. One of the coding schemes was used to analyse the data from the interviews, with the second used to analyse the data from the non-participant observations. The ostensive aspect of the process was written in script form and after transcription of the process observations, the two were compared. The coding scheme that was used for the analysis of the data is shown in Table A.3 in the Appendix below. The researcher also tried to include the factors causing variations to the process (where that was indicated by the data) and whether or not variations had an observable impact on outcomes.

Initially, the researcher recorded everything observed as a difference. But, after more observations, it became clear that some 'differences' could be more usefully recorded as 'issues'. Consequently, any difference between the developed process map (ostensive aspect of routine) and the actual performances of it was then recorded as a 'difference'. Any differences or factors that were observed and/or included in the interviews but that were not directly identified in the ostensive aspect of the process were recorded as 'issues'. These 'issues' may have caused (or may not have caused) variations between the ostensive and performative aspects of the process.

The coding scheme was reviewed and developed regularly during data collection phase, with theory from the literature used to underpin the developments. This constant interaction with the literature facilitated improved interpretation of the observations data, and also allowed for modifications to codes/categories to the schemes. It was envisaged, for example, that 'communication' would be a single issue, but it was later delineated as two related issues: 'communication for information exchange (i.e. handover)'; and 'communication for co-

operation' (see Appendix Table A.3). Eventually the schemes were combined into a single comprehensive scheme including the differences and issues relating to the care process as contained within both the interviews and observations data. With the data collection phase almost complete, all of the data pertaining to performances of routines and interviews was loaded into and coded within NVIVO. This facilitated the interrogation of the large quantity of data that had been collected, as well as a more thorough analysis.

Secondary data analysis

Secondary data was also collected and analysed from the Hospital's existing records. The database used for this study is a combination of two smaller databases provided by ED and ASU practitioners. The two separate datasets were merged. The data included patients admitted to the ED with suspected stroke who were subsequently admitted to the ASU. The number of patients the datasets captured for the period 2015-2017 was 2662 from the ED data set, with only 1358 recorded in the ASU data set. After merger of the datasets the number of records was 1219 patients. After scholastic data cleaning 69 duplicated entries were then removed and the final dataset consisted of 1150 patients who had completed the care process.

Table 3.7 provides a brief descriptive demographic analysis of the data. The dataset comprised 467 (40.61%), 463 (40.26%) and 220 (19.13%) stroke patients admitted during 2015, 2016 and 2017 respectively. Incidence of stroke was equally spread between 574 (49.91%) males, and 575 (50%) females with data for this field missing from one patient record. The age of patients ranged from 20 to 80+ years. Incidences of stroke took place mostly amongst elderly people. Specifically, 508 (44.17%) of patients were aged 80+ years, with a further, 497 (43.22%) aged from 60-80 years. Of the remainder, 136 (11.83%) were 40-60 years and 9 (0.78%) patients were aged 20-40 years.

	Number of patients	Percent (%)
Year of arrival		
2015	467	40.61
2016	463	40.26
2017	220	19.13
Gender		
Male	574	49.91
Female	575	50.00
Blank	1	0.09
Age		
<80	508	44.17
60-80	497	43.22
40-60	136	11.83
20-40	9	0.78
Total	1150	100

Table 3.7: Brief descriptive analysis of secondary data

3.4 Reliability and Validity of the data

The case study approach has been critiqued in terms of a lack of generalizability of findings which restricts the data from contributing to the development of new scientific knowledge (Suryani, 2008). Researchers argue that there are concerns about reliability, since research findings may not be replicated elsewhere (Crotty, 1998). Replication in any type of case study is very difficult given that the time and context of the study are very specific (Jick, 1979). However, the hospital of study in this instance is a regional district hospital like many others in the UK. Therefore, it can be anticipated that the findings of this study can be generalizable to some extent in relation to similar hospitals within the UK.

The reliability and validity of case study findings has also been questioned due to the researcher's necessarily 'inside' perspective, with suggestions that need to collect data through interacting with the subjects of the study may cause bias within the findings. Flyvbjerg (2011) however responds that "the question of subjectivism and bias toward verification applies to all methods, not just to the case study and other qualitative methods" (p.510). Whilst no observations are completely bias free, neither are they necessarily completely subjective. Steps were taken to minimise potential sources of bias within this study, including a triangulation method for data collection that was employed to minimise the effect of the researcher's insider perspective, and to increase the validity of the findings.

Moreover, the researcher was able to validate the collected data in a number of different ways throughout the data collection process. Firstly, the use of different methods to collect the data was beneficial for assessing it, as findings were compared from different

perspectives. Spending a lot of time with the study participants also allowed for the development of close relationships and a consequently greater ability on the part of the researcher to fully capture the meaning of practitioners' responses. The development of these relationships also meant that practitioners were sufficiently comfortable to share important information that may not otherwise have been communicated.

3.4.1 Validity and variability of the primary and secondary observations

As detailed above, the researcher was unable to directly observe the whole care pathway of every stroke patient admitted during the observations. Consequently, the researcher interviewed the relevant practitioners who related observations about these parts of the care pathway. Due to the potential for variability within these practitioner recollections, the researcher took steps to control potential bias in the data: Practitioners were interviewed the same day, as soon as they were available, providing the best possible chance of recording events as accurately, and in as much detail, as possible. Secondly, the researcher cross-checked every stage of live coding and interview coding to looking for different patterns of variation. Table 3.8. below shows a sample of comparisons made between the primary and secondary observation data.

Patient number	Observed all the stages (YES/NO)	Patient type	Pathway variation	Pathway stages					Does the process follow similar pattern of variations (yes/no)? and if no why?
				Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	
1	Yes	FAST -		Paramedics did not inform ED staff	ED doctor unavailable to assess and accompany patient to RD	Radiologist failed to liaise with ED staff	ED doctor unavailable to assess the patient from the beginning/ Unavailable bed in ASU	SNP did not accompany patient to ASU SNP delayed giving a handover to the stroke nurse	-
5	No	FAST +		Paramedics informed ED staff 5 minutes before arriving	ED doctor did not accompany patient to RD Process-order (Patient had his CT scan after he was allocated to the bed)	Radiologist failed to liaise with ED staff	SNP & ED doctor unavailable to assess to clerk the patient from the beginning Unavailable bed in ASU	SNP did not accompany patient to ASU	Yes
8	No	FAST-		Paramedics did not inform ED staff	ED doctor unavailable to assess and accompany patient to RD	Radiologist failed to liaise with ED staff Radiographer liaise with radiologist	SNP unavailable to assess the patient from the beginning/ Unavailable bed in ASU	SNP delayed giving a handover to the Stroke nurse	Yes

Table 3.8: Sample of comparison made between the primary and secondary observation data

In Table 3.8., patients 1 and 8 were GP referrals who arrived at the hospital by ambulance. In the case of patient 1, the researcher was with the SNP in the ASU where the SNP was assisting the stroke doctor with the care of another patient who had arrived some minutes before from ED when the ED coordinator informed the SNP to go and assess the patient. The SNP accompanied by the researcher, ran to the ED, and met the patient at the allocated bed, where the SNP started patient clerking.

Similarly, in cases of patient 5 and 8 the researcher was with the SNP in the ED, where the SNP was clerking a FAST+ patient, when the ED coordinator informed the SNP of the new patient arrival. In both of these cases the researcher was unable to observe patient admission at the front door, but after interviewing the medical staff (the same day) noted variations such as failure of the ambulance crew to recognise stroke symptoms in the patient and to pre-alert ED staff and; staff not being available to carry out their tasks (i.e. SNP) plus other variations as shown in Table 3.8.

3.5 Summary

In this chapter the chosen research paradigm for this study, (i.e. “realist”), and its methodology has been presented. Following this, a pragmatic case study, (chosen as the appropriate methodological choice for this research regarding the adoption of an OM process in a healthcare organisation in the UK), has been presented and justified. Regarding data collection methods; the analysis of archival documents, non-participant observations, semi-structured and unstructured interviews, focus groups, secondary data analysis and process mapping techniques have been discussed. The data analysis methods and criteria that were employed have also been expounded. Finally, issues of reliability and validity of the selected methods, and steps taken to ensure the integrity of the data collection methods has been discussed. In the following chapter the collected data and subsequent analysis are presented.

4 The case study

The case study comprises detailed exploration of the experience of implementing an acute stroke care ‘pathway’³ in a UK NHS hospital (Jan 2015-December 2016). Located in the west of England, the 565 bed, hospital employs 4800 staff, providing a comprehensive range of acute services including medicine and surgery⁴, emergency department, diagnostic and clinical support services. Throughout the remainder of the thesis it will be referred to as ‘the Hospital’.

What is a stroke?

A stroke occurs when the blood supply to part of the brain is interrupted causing brain cell damage. According to a Hospital Stroke Consultant, symptoms include “left/right face weakness or ‘emotionless-ness’ down one side of the body, unclear speech or difficulty finding the correct words, or difficulties with vision”. There are three types of stroke:

1. Ischaemic stroke. The most common type caused by a blood clot in one of the blood vessels supplying the brain.
2. Haemorrhagic stroke (Intracerebral Haemorrhage). The second most common type; caused by bleeding into the brain due to a burst blood vessel.
3. Transient Ischaemic Attack (TIA). This is a type of mini stroke caused by a temporary break in the brain's blood supply. Symptoms do not last for long and patients do not typically need admitting but TIAs are taken seriously as they are a warning indicator for future strokes.

With specific reference to *the Hospital* Figure 4.1 shows the final diagnosis of patients arriving at the Hospital who were initially suspected of having suffered a stroke within the period (01/01/2015-31/07/2017). Most of the patients, 1048 (91.13%) were diagnosed with Ischaemic stroke. While 88 (7.65 %) patients were diagnosed with TIA and 12 (1.04%)

³ The acute stroke care pathway was a nationally mandated set of clinical activities, intended to improve care outcomes following incidences of stroke. It was designed to be followed by any stroke patient admitted into the hospital through the emergency department.

⁴ Acute Medicine forms part of the Emergency Directorate, and consists the Medical Assessment Unit (MAU) the Chest Pain Unit (CPU) and the Medical Short Stay Unit (MSSU). Those units have a target length of stay of up to 12 – 24 hours, and are for the initial assessment and management of acutely ill medical patients prior to discharge or admission into the hospital (see: http://www.ruh.nhs.uk/For_Clinicians/departments_ruh/Acute_Medicine/index.asp).

were finally diagnosed without stroke. It was interesting to see that there were only 2 (0.17%) patients admitted with Intracerebral Haemorrhage within the available dataset.

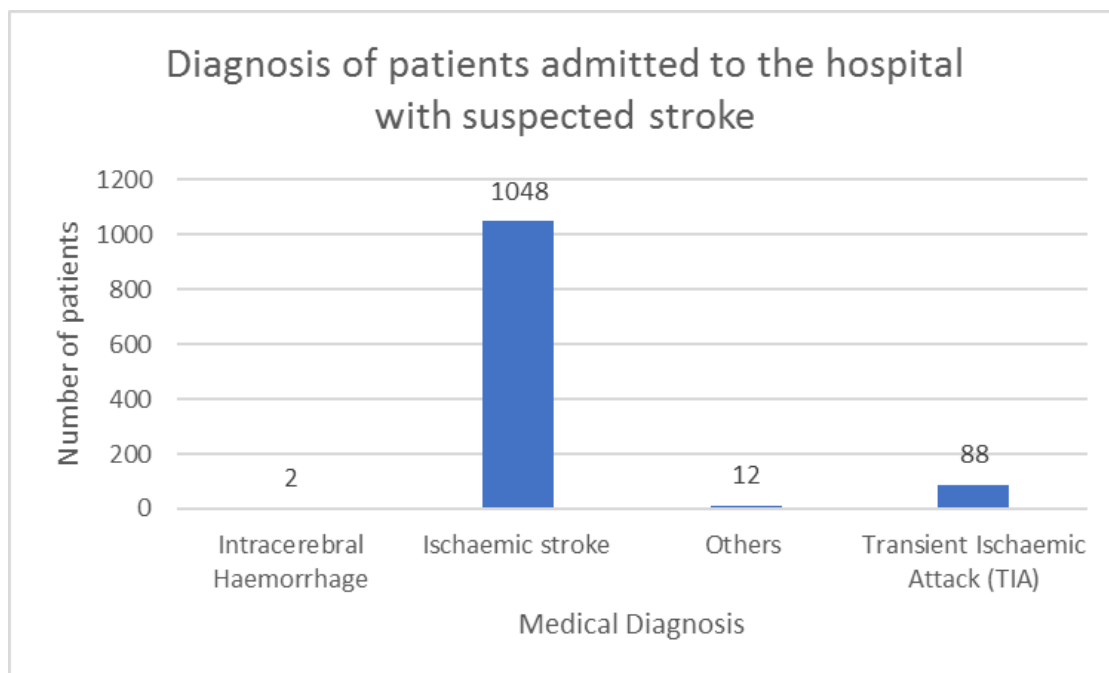


Figure 4.1: Medical diagnosis of patients admitted in the Hospital with suspected stroke

Stroke at the Hospital of study

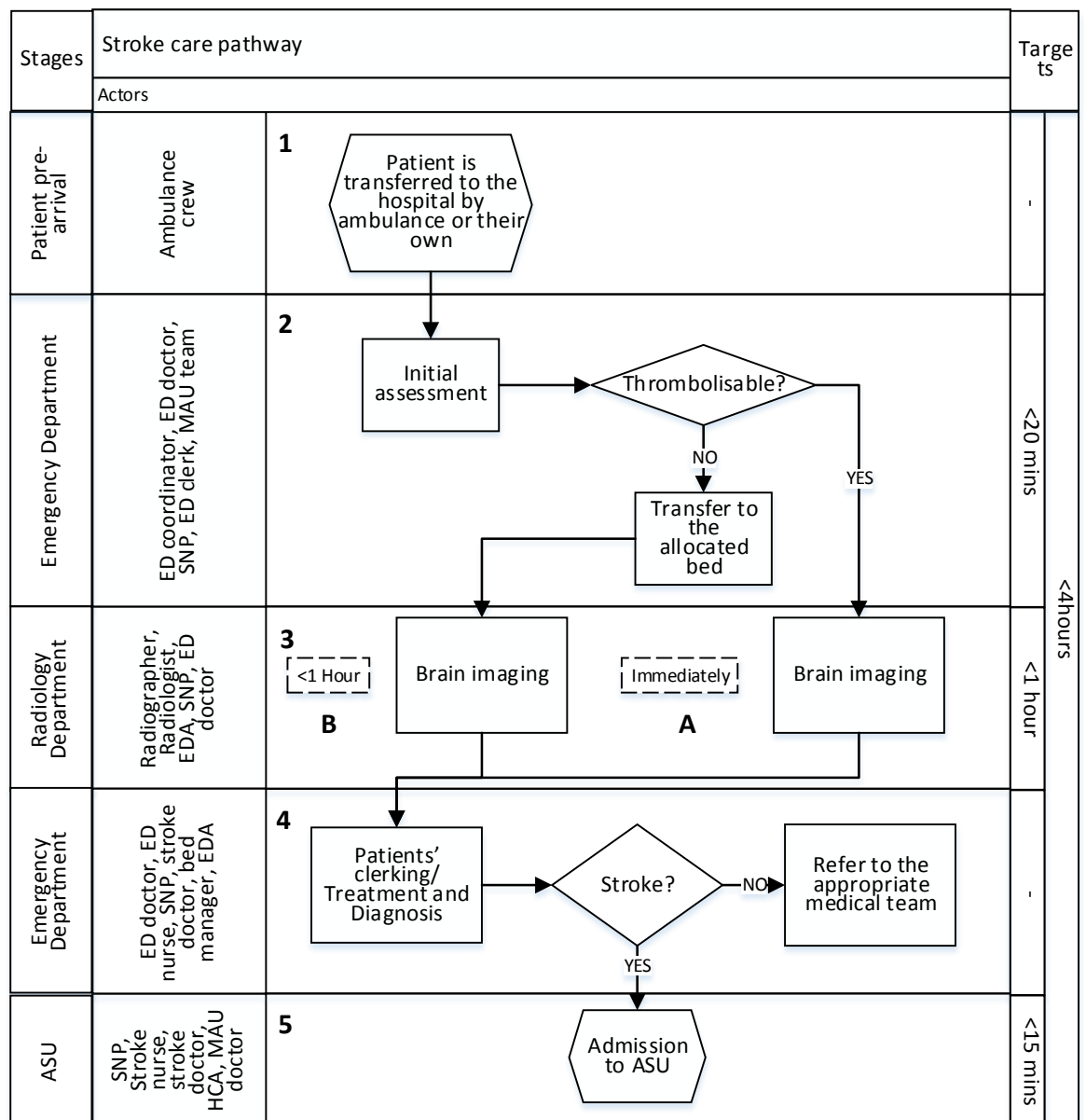


Figure 4.2: The official stroke care pathway at the Hospital

Table 4.1. provides a brief definition of each symbol used to design the pathway flow diagrams.



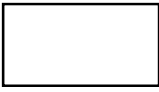

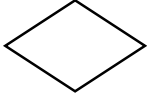


Symbol	Name	Function
	Flow line	Flow line connectors show the direction that the process flows
	Connection line	This connects different steps in the process, that are not particularly happening in a sequence
	Process/Activity	A rectangle represents a process/activity
	Sub-process / Procedure	A rectangle with 2 lines represents another process/activity happening at the same time elsewhere
	Decision	Indicates a question in the process flow. There are 2 options (Yes/No)
	Issue/variation	Represents an issue/variation of the process from the abstract version of it
	Preparation	As the name states this symbol represents a preparation of a process. Particularly, it shows the start AND result of a process

Table 4.1: A brief interpretation of the function of each symbol used in the flow charts

All the stroke patients were admitted to the hospital through the emergency department (ED) and followed the stroke care pathway for their treatment. The overview of the hospital's implementation experience of the stroke care pathway will be structured around the five key stages of the 'official' stroke care pathway. Figure 4.2 (above) summarises these stages.

This diagrammatic representation highlights how the pathway crosses organisational and spatial boundaries (i.e. the left-hand column indicates the specialist staff involved in, and the departmental location of, the care stage) and moves through time (i.e. the right-hand column presents approximate timings). The care process moves through a chronological order from top to the bottom. The arrows between the boxes denote the flow. The text boxes highlight the activities/tasks to be completed.

1. Patients arrive at the hospital independently (alone, with family/friends, etc.) or by ambulance.

2. On arrival at the Emergency Department (ED), staff should immediately assess the patients and, if diagnosed as emergency stroke patients (designated: **FAST+**) and judged suitable for thrombolysis treatment⁵, they should be transferred immediately for brain imaging (CT scan). Non-**FAST+** patients should be transferred to an allocated bed in ED, and have their assessment within 20 minutes.
3. All patients should receive their CT scan in the Radiology Department (RD)
 - A. All the FAST+ patients should have their scan immediately
 - B. All the FAST– patients should have their CT scan within 1 hour of their arrival time
4. All patients should be transferred back to the ED and receive their medical assessment (i.e. chest X-ray, heart rates monitoring, swallowing test, medication etc.) and treatment (if it is needed).
5. Patients diagnosed with stroke should be admitted to the acute stroke unit (ASU) where they should receive specialized care. Stroke patients should be admitted to the ASU within 4 hours of their time of arrival at the hospital and within 15 minutes of the time of stroke diagnosis and the admission decision.

In each of the following sections, a description of the official version of each of these stages, derived from formal national and local documentation, is presented. Using these ‘official’ descriptions as a starting point, the primary data of observed variations (noting the number of instances and types) in each official stage is then detailed in text and diagrammatic form. Where appropriate/available, secondary data describing hospital and pathway performance are also provided.

As explained in the previous chapter the researcher was not able to observe the whole care pathway in the case of every patient. For the stages of the process that the researcher could not observe’ the relevant practitioners were interviewed to collect the data for those instances. In total, data for 52 instances of patients following the stroke care pathway were collected. Table 4.2. provides a descriptive analysis of the patient data collected from primary data observations and secondary sources.

⁵ Thrombolytic therapy is the administration of drugs given to the patients with ischemic stroke. This should be provided to the patients within 4 hours of stroke onset (<https://vascular.org/patient-resources/vascular-treatments/thrombolytic-therapy>).

The data samples indicate similar results. This is a further verification that the sample of patients observed during the course of the study was representative, and thus captured the reality of the stroke care pathway within the Hospital. The analysis of the secondary data, followed by the primary data, is presented below. In the left hand side column the analysis of the secondary data and in the right hand side column the analysis of the primary data (collected from the observations) are presented.

The highest proportion of stroke patients [943(82%)/42(80%)] were referred to the Hospital by Emergency Services, while the least number of patients [15(1.30%)/2(3%)] were referred by other sources (all 999 services). Consequently, the most common mode of transport to the Hospital was by ambulance [951(83%)/43(82%) patients]. The number of stroke patients arriving at the hospital on each day of the week was similar, without any particularly significant anomalies. However, it was interesting to note that the largest numbers of patient arrivals occurred during mornings [471(40.96%)/21(40%)] between 8am-12pm, and that the second largest window for arrivals was in the evening [352(30.61%)/16(30%)] between 5pm-12am. Finally, most of the patients from both datasets arrived at the hospital initially diagnosed as FAST-, [158(13.74%)/5(10%)], however, only 161(14%)/1(1.9%) of those patients received thrombolysis treatment.

	Secondary		Primary	
Description	Number of patients	%	Number of patients	%
Source of referral				
Emergency services	943	82.00	42	80
General Practitioner	92	8.00	5	10
Health care provider	33	2.87	-	-
Self-Referral	67	5.83	3	7
Others	15	1.30	2	3
Transfer to the hospital				
By ambulance	951	83%	43	82
Other	199	17%	9	18
Arrival day				
Monday	177	15.39	6	11.54
Tuesday	164	14.26	7	13.46
Wednesday	161	14.00	7	13.46
Thursday	178	15.48	8	15.38

Friday	164	14.26	7	13.46
Saturday	148	12.87	10	19.23
Sunday	158	13.74	7	13.46
Arrival time				
Morning (8am-12pm)	471	40.96	21	40
Afternoon (12-5pm)	246	21.39	7	13
Evening (5-12am)	352	30.61	16	30
Night (12am-7:59am)	81	7.04	3	7
Type of patients				
FAST+	158	13.74	5	10
FAST-	932	81.04	47	90
TIA	60	5.22	0	0
Received treatment	161	14	1	1.9
Total	1150		52	100

Table 4.2: Descriptive data of both, secondary and stroke patient datasets

4.1 Pre-arrival stage

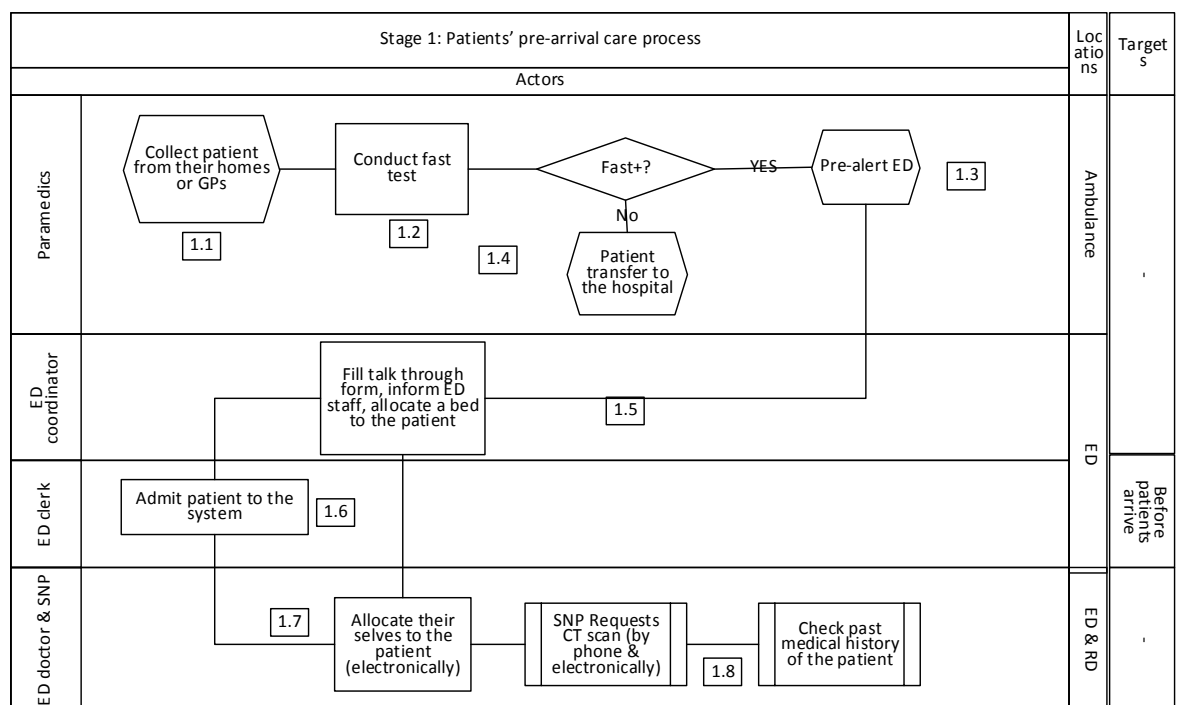


Figure 4.3: The official description of Stage 1

Stroke patients arrive at the hospital through a variety of different routes. They may be referred by paramedics, general practitioners (GPs), by self-referral or via concerned relatives/friends as well as by other services such as private healthcare providers and the

police. For patients transferred by ambulance, the ambulance crew paramedics collect patients from wherever they may be.

1.1. Paramedics should conduct a FAST+ assessment.

1.2. If patient is triaged as FAST+ paramedics should inform/pre-alert the ED coordinator

1.3. The ambulance crew transfer the patient to ED

1.4. In instances where the patient was referred via a GP the General Practice should have already informed the ED staff. Self-referred patient begins the entire process on arrival – there is no pre-arrival activity.

1.5. If an ambulance crew pre-alerts the ED staff, the ED coordinator should complete the pre-assessment form (referred to as “talk through” form) (i.e. take general patient information from the ambulance crew: see Appendix and informs the senior doctor and SNP (if available). The ED coordinator also allocates a bed to the patient in high dependency care (highest priority area of the ED) and gives a handover to the ED nurse in charge of that area.

Table 4.3: Descriptive data of both, secondary and primary stroke patient datasets

1.6. The ED clerk should prioritise patients’ admission in the system and admits patients before they arrive in ED

1.7. The SNP allocates themselves to the patient electronically

1.8. Finally, the SNP should request the brain imaging test and check the past medical history of the patient

4.1.1 Variations of the patient pre-arrival stage

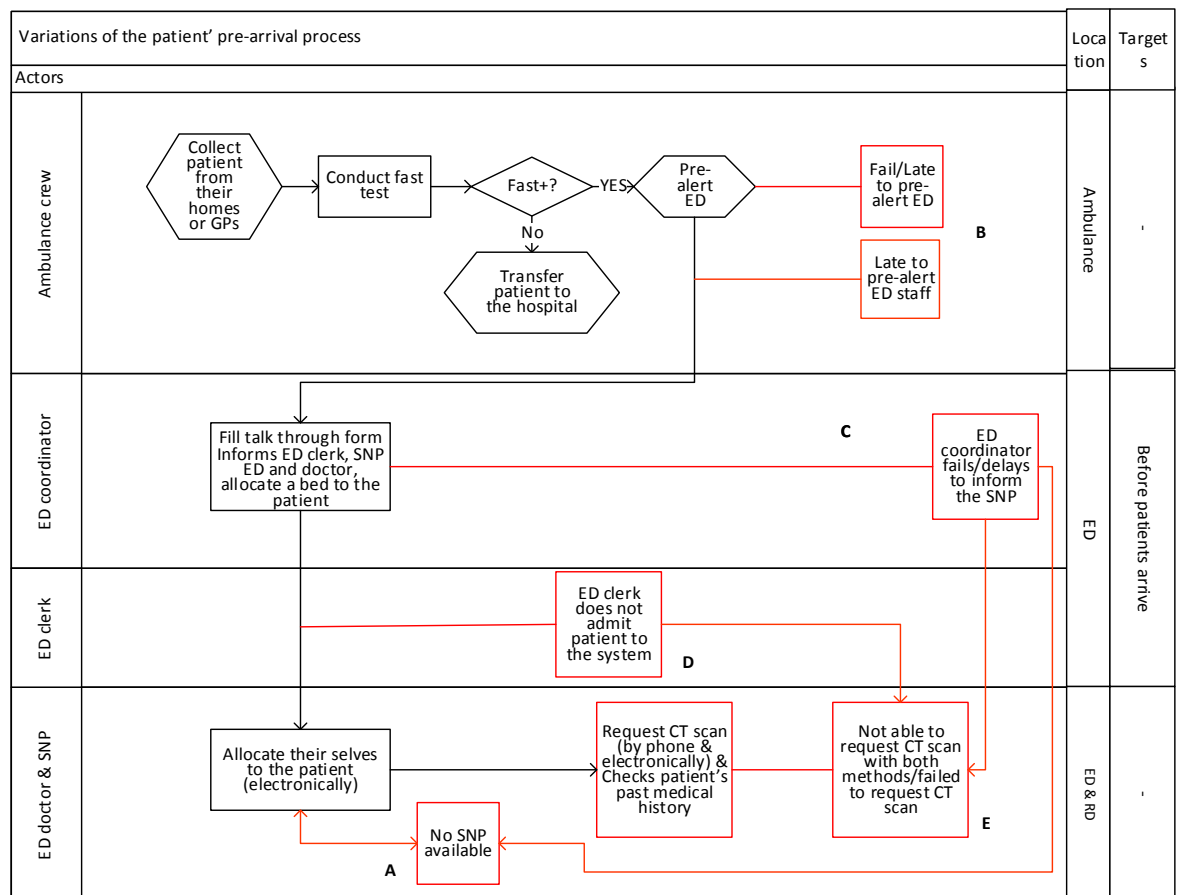


Figure 4.4: Variations of the patients' pre-arrival stage

Variations in resourcing (e.g. SNP not available)

The most frequently observed source of variation in this stage was the practitioners (particularly of SNP) not being available to initiate the patient pre-arrival process (Figure 4.4.(A)). Similarly, analysis of the secondary data indicated that only 23 patients had received pre-arrival assessment by a SNP. This variation was caused by several distinct factors, but was primarily due to:

- Communication issues: The failure of the ED coordinator to inform the relevant practitioners when the pre-alert from ED staff came through (see Table 4.3., inter.: 1,2)
- Scheduling issue: The unavailability of practitioners on-site (mainly outside of designated practitioners' hours of work) (see Table 4.3., inter.: 3,4)

- Shared resources: The fact that the practitioners were busy dealing with the care of another patient and could not attend the process at that time (Table 4.3., inter.: 5). This issue was often observed when an increased number of stroke patients were admitted at the same time, challenging the ability of practitioners to meet all their needs (Table 4.3., inter.: 6,7)

By way of example, one Friday afternoon at 3pm, the paramedics pre-alerted ED staff to the imminent arrival of patient 5. The ED coordinator answered the phone, received a handover from the paramedics and completed the referral form. The ED coordinator finished the phone call, gave the referral form to the ED clerk requesting that he admits the patient to the system, and then searched for the ED doctor to inform him of the incoming patient. The doctor was in one of the cubicles next to the staff desk, assessing a patient who had come in some time before. The ED coordinator moved the curtain, put her head in and said: “We have a FAST+ coming in, in 30 mins”. ED doctor replied: “Let me know when he is here”. The ED coordinator then immediately went to inform the SNP, who was busy finishing up the discharge process of a patient who had just completed his assessment and needed to be transferred to the ASU. The SNP said to the ED coordinator: “I will finish with this discharge, take this patient down to ASU and come right back...”. In this case, the SNP was unable to go and initiate the care process of the pre-alerted FAST+ patient (i.e. book CT scan, check patient’s medical history) since she was busy dealing with the discharge process of another patient. When the researcher asked the SNP why she could not leave the emergency department assistance (EDA) to transfer the patient to ASU alone she said: “I cannot do that. I am the one who had assessed him and can give the best handover, both to the stroke nurse and doctor in order to initiate his monitoring. So, I cannot just leave him to be discharged. I need to complete this pathway and then initiate the next one”.

Variations in communication (e.g. fail/late administrative information exchange)

The second most frequently observed variation was within the communication process, the exchange of administrative information between the practitioners. It is important to note that some administrative exchange variability is essentially exogenous, driven by the patient/carer/relative being unable or unavailable to provide basic admission and symptom information:

“It may be delayed because you are waiting for crucial information from the family or someone like that, whether they are able to receive the treatment or not.” (SNP 2)

Although much of this information is unnecessary, or at least not critical, for treatment, staff being unable to initiate key administrative processes (i.e. book in, request diagnostic tests, etc.) impacted upon practitioner's ability to comply with the official pathway.

Often, variation in communication (patient pre-alert) between the ED staff and paramedics was observed. Some practitioners stated that such communication issues happened due to paramedics' lack of competence on stroke care preventing them from recognising the stroke symptoms of the patient and share such information with ED staff. Paramedics' failure to recognise stroke symptoms can cause delays in the initial process (Figure 4.4. (B)):

“The quality of information from the ambulance crew can make a difference when bringing in a patient. Because sometimes it's great information, brilliant, everything is correct. Other times the information may be questionable. You may see the patient and assess that the notes do not reflect the symptoms presenting themselves." that can delay things” (SNP1) (see also: Table 4.3., inter.: 8,9)

This variation was also observed during the on-site observations. For instance, patient 8 arrived with the paramedics at ED one Tuesday afternoon. The ED coordinator received the patient at the front door and paramedics began a handover. On the paramedics' notes it was written that the patient failed to pass the FAST test, but was nevertheless triaged as FAST-. One of the paramedics said to the ED coordinator: “when we arrived at his place he was down on the floor. We tried to get some information from him, but he was really talking no sense”. ED coordinator looked at the paramedics and said: “this is probably a stroke”. ED coordinator immediately allocated a bed to the patient, asked the paramedics to transfer him there and informed the ED doctor to go and assess him. The ED coordinator returned to the ED desk and phoned RD staff to book a CT scan. In this instance, the researcher considered that paramedics had failed to pre-alert ED staff, but the ED coordinator diagnosed the patient with a stroke at the front door assessment. In 2 instances observed (2., patients 5, 21), paramedics pre-alerted ED staff, but only 5 minutes before arrival at the Hospital (Figure 4.4. (B)).

Other practitioners argue that existing artefacts (Fast test) used by the paramedics to assess the patient were not sufficient enough to support the diagnosis of the patient:

“I think FAST test is not sufficient enough for those patients that are difficult to diagnose, and they need trained staff to pick those patients up because they are the ones that fall through the net” (EDN2) (see also: Table 4.3., inter.: 10,11)

Communication issues regarding exchange of information for the arrival of stroke patients were also observed between the ED staff and the stroke team. This would happen, due to ED staff not being competent enough to recognise the stroke symptoms of the patients:

“So, if the patients present by themselves and the receptionist does not assess that they may have had a stroke then there could be a significant delay.” (SD 2) (see also: Table 4.3., inter.: 12,13)

Or because ED staff were very busy and, in such cases, often communication suffered. Nonetheless, as already noted the above failure of the ED to inform the SNP led to a further variation of the availability of the stroke team (SNP) to attend the pre-arrival process (Figure 4.4. (A)).

Communication failure was observed between ED/SNP and RD staff in requesting CT scans. In most of the cases ED staff and/or the SNP did not request a CT scan using both methods specified in the pathway (phone and electronically) but only by phone. This could happen due to other communication failures between the practitioners, or because practitioners were dealing with multiple patient groups at the same time and thus, being unable to carry effectively and efficiently all their tasks:

“ED staff forget to inform us (radiographers). I just assume it is pressure and they have so many things they are trying to do...we often forget about communication for all the patients, whether they are trauma or whether they are FAST+” (SR1)

System failure

Failure of the ED coordinator to admit patients into the Electronic Patient Report (EPR) system (Figure 4.4. (D)) was also observed to be a significant source of variation. This was primarily the result of communication issues. Paramedics either failing, or being unable, to provide enough patient information or alternatively because the ED clerk was busy admitting other patients (also admitted as emergency patients) at that point in time. This unavailability of patient information in the system subsequently prevented the SNP/ED staff from requesting a CT scan electronically (Figure 4.4. (E)).

Patient pre-arrival						
			Data source			
Variation type	Activity	Actors involved	Observations (Patient number)	Secondary data	Number of / Interview quotes	Attributable factor
Unavailability of resources	Request CT scan and check medical history	SNP-ED staff	21 (2,5,6,8,11,12,14,15,16,19,26,30,39,41,43,45,47,48,50,51,52)		1 “Sometimes, ED staff do not inform us. If they do not inform us that there is anybody coming in, we do not know. Then the care process is delayed.” (SNP 1)	Communication issues
					2 “I cannot do anything unless somebody bleeps me. I can only see what is on the screen and I cannot see the screen all day because I have other things to do. So, I need to be informed if there is anything I need to respond to. Sometimes, we are not informed - not often but sometimes - like this morning. So if they do not inform us that there is anybody coming in, the starting process is delayed” (SNP 3)	
					3 “The SNP should assess the patient quickly and you may have problems as they are only available until 9pm at night during weekdays and 5pm during the weekends. Therefore, there might not be an SNP available” (SD2)	Scheduling issue
					4 “It will just take a bit longer than if it was standard working hours, because there is less staffing at the weekend for radiographers and radiologists.” (SNP2)	
					5 “If there is more than one stroke patient that comes in, there will be a delay. The SNP can only treat one patient at a time.” (ED nurse)	Shared resources
					6 “We do not know why we are getting so much busier. But, there are days like I did on Sunday a couple of weeks ago when we had hundreds of patients - more patients than we normally admit in a day. And physically you cannot fit everybody in. If we are short staffed, due to sickness or annual leave, then that can cause delays. All it takes is one or two people	Shared resources & Patient demand

						that are off sick, or one of the wards to be very full and then we are overloaded with work” (ED1)	
					7	“What happened was that 3 people were admitted in 2hrs in the emergency bay and they needed more care. It is more intensive when they first arrive as there is much to do to admit them, assess them ,medicate them and deal with/support their relatives. That is why it is hard when you are short staffed” (SNP2)	
Communicati on issues	Pre-alert	Paramedics – ED staff	17 (1,2,3,5,6,8, 10,14,15,18, 21,26,30,39, 40,49,50)	23 (2.12%)	8	“Not every stroke patient gets picked up by the paramedics thus, ED coordinator does not know about it as well. Sometimes, you have technicians who bring the patient in. The patient might have been seen by a rack respondent who is a paramedic, but then you might have some communication issues there.” (SNP 2)	Staff competence: Failure of paramedics to diagnose stroke symptoms
					9	“Sometimes the paramedics do not understand the system. We get people who are from outside the area and maybe they do things differently in other places and they do not realise that they’re meant to pre-alert us.” (SN2)	
					10	“Well, there are 2 things about the Fast test. Firstly it is not sufficient enough to assess when people do not have a stroke. And secondly, it does not pick up people with coordination problems. So, the paramedics may fail to recognise stroke symptoms. They may get too many of one group of patients and too few of another group of patients” (ED 2)	Artefacts’ inefficiency
					11	“There are some patients that have coordination problems that are not easily picked up by the Fast test so the paramedics are not alerted to their condition. And do not recognise that they have had a stroke.” (ED 2)	
		ED staff- Stroke team			12	“You know sometimes the coordinator assesses them and they do not get it right.”...”For the more difficult patients, there might be delays... the strokes that do not immediately present as obvious strokes, delays can happen” (SD 3)	Staff competence: Failure of the ED staff to capture stroke symptoms

					13	<p>“It depends on the history of the patient and how that patient is examined. So, sometimes people without the right skills may struggle to assess the patient, whereas somebody with the right skills would have picked up and correctly diagnosed. It may be that all the major symptoms were very vague and they were not able to differentiate between delirium, sepsis and something else.” (SD 2)</p>	
	Request a CT scan	ED staff/SNP – RD staff	8 (9,19,21,24,43,45,47,52)			-	Shared resources
System failure	Patient admission to the IT system	ED staff -		4 (24,45,47,52)		-	Shared resources & Communication issues

Table 4.4: Descriptions of variations observed in patients’ pre-arrival stage

4.2 The patients' ED admission stage

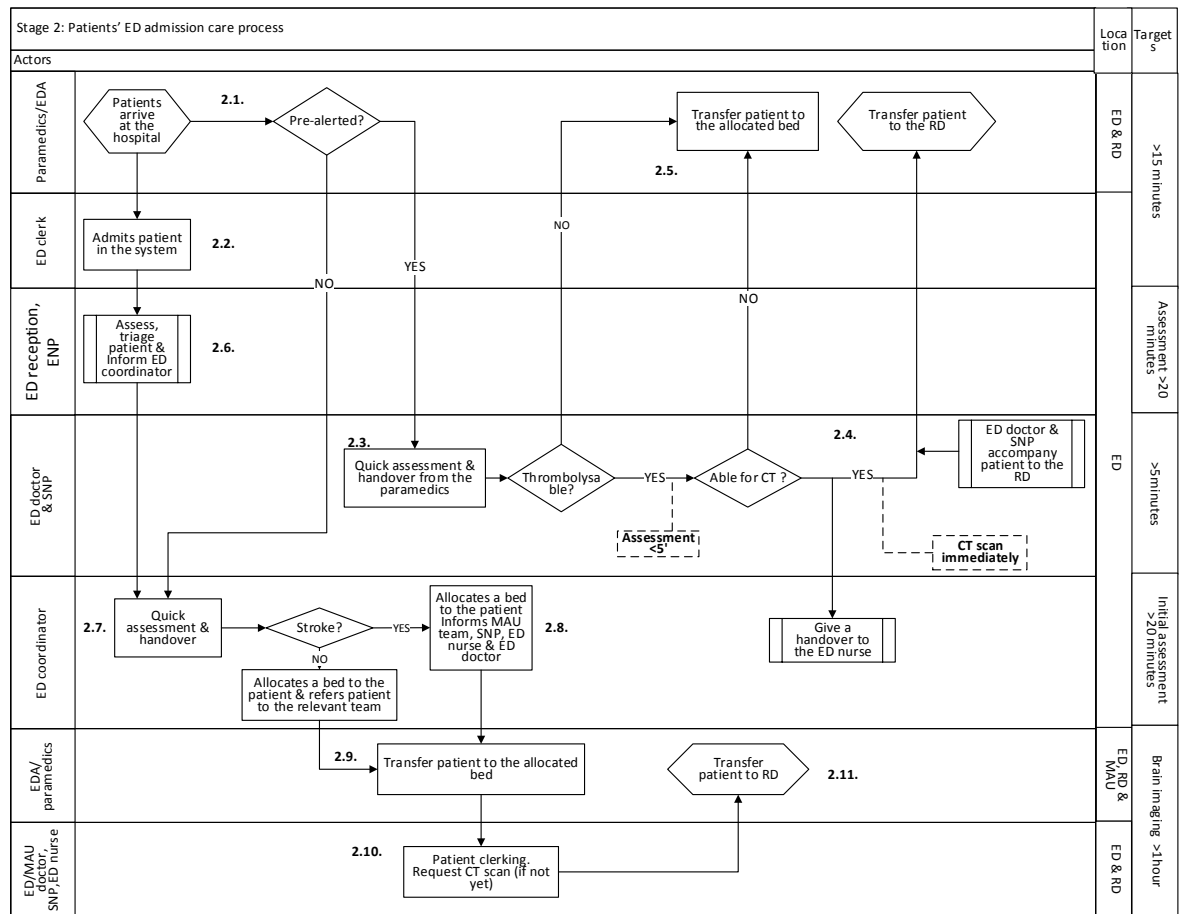


Figure 4.5: Description of the official version of patients' ED admission stage

Acute stroke patients arrive at the front door of the ED.

- 2.1. The ED Clerk takes the patient forms from the paramedics and admits the patient into the system (if the patient arrival has been pre-alerted (ambulance pre-alerted) the ED Clerk should have already admitted the patient in the pre-arrival stage). Patient admission to the system should happen with 15 minutes of arrival.
- 2.2. If patients are ambulance pre-alerted the SNP and ED doctor should be present, and should quickly assess the patient at the front door receiving a handover from the paramedics while ED doctor decides if the patient is thrombolysable. If yes, ED doctor decides if the patient is able to have a CT scan straight away. Front door assessment should not last more than 5 minutes.
- 2.3. If patients are medically able to have a CT scan, paramedics transfer patient to the RD. The ED doctor and the SNP accompany the patient to the RD and the ED coordinator gives a handover to the paramedics.

- 2.4. If patients are not thrombolysable or able to have a CT scan immediately, paramedics transfer patient to the allocated bed.
- 2.5. If patients are non-pre-alerted, but arrive by ambulance (as well as patients who are self-referrals), the ED coordinator receives them at the front door. If patients self-present at the ED, they first register at Reception. The ED receptionist books the patients in and, if she/he has any concerns that patients have suffered a stroke, calls the emergency nurse practitioner (ENP) to assess the patient and inform the ED coordinator. This process should take less than 20 minutes from the time of patient arrival to the hospital.
- 2.6. ED coordinator assesses the patient and receives handover (either from paramedics or ENP).
- 2.7. If ED coordinator recognises stroke symptoms, a bed should be allocated, and other practitioners informed: SNP, ED doctor and doctor within the Medical Acute Unit (MAU). Otherwise ED coordinator allocates a bed to the patient and informs the relevant medical team.
- 2.8. Paramedics transfer the patient to the allocated bed.
- 2.9. ED nurse receives a handover from the paramedics until the other practitioners arrive. When the SNP and MAU doctor arrive, they receive a handover from the ED nurse, begin clerking the patient, and request a CT scan.
- 2.10. EDA transfers patient to RD. CT scan request and assessment should happen within 60 minutes of the time of patient's arrival at the hospital.

4.2.1 Variations of the patients' ED admission stage

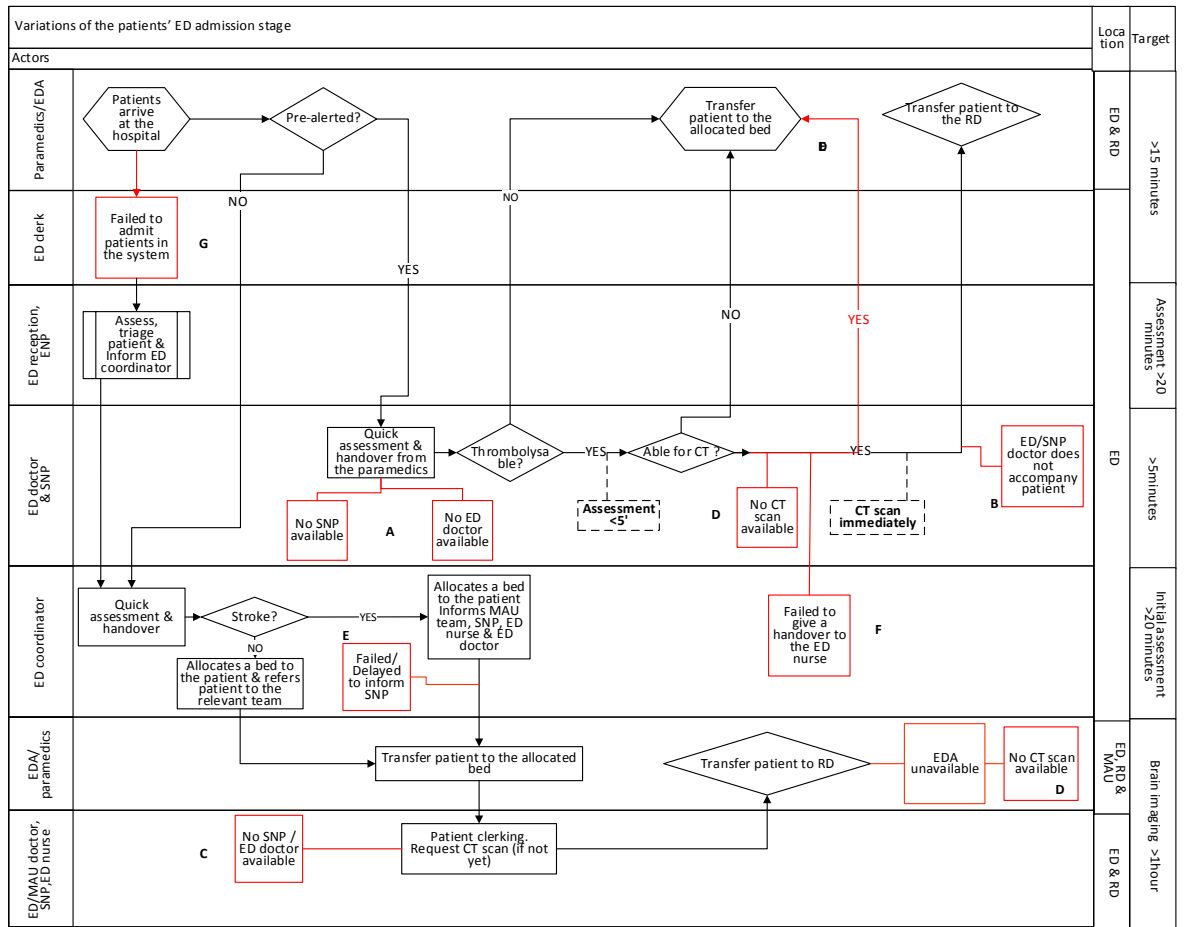


Figure 4.6: Variations of the patients' ED admission stage

In this stage of the stroke care pathway 5 different types of variation were observed.

Unavailability of resources

The primary source of variation observed in this stage was the unavailability of practitioners to carry out tasks, such as availability of the SNP and ED doctor to assess a patient at the front door (Figure 4.6. (A)), accompany the patient to RD (Figure 4.6. (B)), to carry out patient assessment (Figure 4.6. (C)):

“What actually happens is that ED phones that a FAST+ patient arrives/ and I go down and the ED doctor says okay the patient can go straight to CT. And then when the patient arrives I end up going alone to the CT, no one is accompanying me.”
(SNP)

This usually was a consequence or continuation of the variations observed in the previous stage; usually if the SNP and ED doctor were unavailable at the first stage, they were also unavailable at this stage (e.g. Table 4.4. patients 2, 12, 14, 15, 16, 19, 26, 39, 41, 43, 47, 48, 50, 51). Practitioners argue that this might be attributable to the need of ED department to share its resources with multiple hospital patient groups. This resulted, firstly in an increase of practitioners’ workload and inability to leave the department:

“There are times when the workload in the department is high and there might be times when SNPs go to RD by themselves. They (the SNPs) will come back and look at the report together with the ED doctor. Meanwhile the ED doctor will continue to look at the patients in the department.” (ED2)

And secondly, in an informal patient prioritisation system for the allocation of their resources, ED staff may prioritise the care of other patients (usually sepsis) admitted to the department at the same time:

“The ED doctor may have other conflicting things going on. For example there may be a trauma patient there which may impact his abilities to assess the patient quickly” (SNP 1) (see also: Table 4.4.: inter. 14-18)

Some of the practitioners explained that such variations in their availability to carry out their task could happen due to failure of the system (Table 4.4., 19). The IT system used for the allocation/scheduling of ED doctors was not always working properly, resulting in variations to the process.

Unavailability of resources was not only observed regarding the practitioners, but the medical assessment equipment as well. Frequently, there was not an available CT scan slot for the patient to go through. This could happen either because of the business of

RD due to the high volume of patients coming in and consequently being unable to provide CT scans to all the patients immediately:

“And if there is a heavy workload for the CT they may not know how to prioritise and get your patient in. They may call you and say come in 5mins. And if you miss your slot by 1 or 2 minutes, you may have to wait another 30 mins. That happened a few times. So, it is the prioritisation and the workload of the CT that can cause difficulties.” (SNP 3) (also see Table 4.4.: inter. 23)

or because of scheduling issues - limited availability of practitioners to meet patient demand:

“We try to do things as fast as we can and particularly in this case, provide CT scans to all the ED including stroke patients within 1hr. But currently, we have 17 radiologists and we have a workload for 30 radiologists and we pay £1000000 outsourcing. We do not have the staff to deliver this” (SR1)

or because ED staff were very busy, and consequently being unable to walk with the patients to the RD.

It could also be a consequence of the physical unavailability of such resources - the time that patients were admitted into the hospital (i.e. off-hours)

“The accessibility of CT is a bit of a problem in the overnight hours when the CT scan department is not formally open. It is all right until about 9pm at night but, then from 9pm until 8am is not open and you have more difficulties getting a CT scan.” (SD 2)

In any case, variations in the availability of resources such as actor and medical assessment equipment, resulted in variations to the process characteristics such as timeliness and order. For example, secondary data analysis shows that for 167 (14.52%) stroke patients at the hospital initial assessment was delayed (<20 minutes from the time of their arrival at the hospital). While, 925 (80.43%) patients were not seen by an ED senior doctor within 15 minutes from their time of arrival at the Hospital. Of those patients 707(61.48%) were admitted as FAST-, 18 (5.22%) as FAST+ and 60 (5.22%) as TIA.

Similarly, in some instances due to unobtainability of an immediate CT scan slot (Figure 1.6. (D)) patients followed a different pathway, with a different order from the prescribed steps. Even if patients were pre-alerted as FAST+ and should have received a CT scan immediately, they were unable to go straight to RD, and were instead transferred to the ED

bed allocated by the ED coordinator until RD staff were able to perform a CT scan for the patient (Figure 4.6. (E)).

While, in some other cases, pauses in the patient care pathway were observed: a patient waited in the ED without any progress to his pathway. Thus, ED staff/SNP were unable to proceed with his pathway. Secondary data analysis indicates that 1000 (86.96%) patients admitted to the Hospital with suspected stroke experienced a delay in receiving a CT scan. Amongst them, 782 (68%) of the patients were FAST-, while 60 (5.22%) were admitted as TIA, and all endured delays lasting more than 1 hour. The remaining 158 (13.74%) patients were admitted as FAST+ and had their CT scan delayed beyond 15 minutes of their time of arrival at the Hospital.

Variations in communication (e.g. fail/late administrative information exchange)

The researcher further observed variations in the communication process of administrative information, between the practitioners during this stage within the activities of patient pre-alert, the request of CT scan and exchange of handover (Figure 1.6 (F)). As already illustrated above, the ED coordinator sometimes failed to inform the SNP when a non-pre-alerted, (but suspected stroke) patient arrived (Figure 4.6. (G)), which had an impact on the SNP's availability to initiate patient clerking. For instance, patient 10, a middle-aged man that came into the hospital one Saturday morning, was diagnosed as FAST-. The SNP was in the ASU assisting the stroke doctor with the ward round. When the ward round concluded, the SNP returned to the staff base within the ASU and began to look at the Patient First system on the desk computer. This is a system where all hospital staff can see which patients are in the Hospital and monitor patient flow. The SNP observed that stroke patient 10 had been admitted to the hospital, 1 hour earlier, and she had not been informed of their arrival. The SNP immediately took her notebook and ran down to the ED. The patient was located in a cubical in the non-emergency area of the ED and it was observed that there was no-one assessing him. The SNP searched for the patient's notes but could not find them. The SNP walked around the ED and started asking the nurses who was in charge of the patient. Nurses were very busy dealing with the care of other patients and they could not really help her. The SNP then went to the front desk of the ED and asked the ED coordinator: "Who is in charge of patient 10? He has been in for 1 hour now, no one has informed me and now that I have returned, I cannot find his notes or who is in charge of him?" The ED coordinator replied: "Doctor X is, I informed him." Consequently, in this case, failure of the ED coordinator to

inform the SNP meant that she could not facilitate the care pathway process from the beginning.

Such variations in the communication process between the practitioners, were mainly caused because of:

- Patients or their families being unable to provide the required information (e.g. time of onset of stroke symptoms) to the staff to make their diagnosis (Table 4.4., 25). This could cause changes in the order that the process followed (as already mentioned above).

One example of such an instance was patient 12, an elderly woman, 73 years old arrived with paramedics at the front door of the ED, one Monday morning at 10:10am. The patient's daughter, who accompanied her, appeared stressed and upset.

The ED coordinator, who was standing at the front door awaiting their arrival, immediately took the papers from the paramedics and began assessing the patient, while the paramedics were giving him a handover. The ED coordinator tried to talk to the patient, but she was unable to talk and seemed barely able to move. The ED coordinator then took the papers from the paramedics, began reading them and said: "It sounds like a stroke". He then turned to the patient's daughter and asked her: "Do you know what time exactly did this happen to her?" The daughter replied: "I have no idea! I just found her on the floor of the kitchen when I went to have lunch with her. She usually cooks for me every Monday". The ED coordinator then turned his face to the big white board next to them and asked paramedics to transfer the patient to area C where he had just allocated a bed to the patient. He then went to the front desk, picked up the phone and called the RD staff. He said: "There is a stroke patient who needs to have his scan as soon as possible", he finished the phone call and went to search for an ED doctor. Since there was no available information regarding the patient's time of stroke onset, the patient was thus less likely to be suitable for thrombolysis, so the ED coordinator decided to first allocate a bed to the patient and then book a CT scan for her.

- practitioners' failure to diagnose the stroke symptoms of the patient. As already noted above, practitioners might not be able to recognise the stroke symptoms of the patient (Table 4.4., inter.13,14)
- the business of the practitioners and the need to deal with the care of multiple patients at the same time (shared resources) (Table 4.4.: inter. 26)
- because of conflict and problematic relationships among the practitioners of the different groups, having a negative effect on their collaboration (Table 4.4.: inter. 28)

These findings were also supported by analysis of the secondary data. Table 4.5. shows the relationship between the stroke care competence of the ED doctor and timeliness of patients' initial assessment, from analysis of the secondary data. This illustrates that 925 patients were initially assessed more than 15 minutes after their arrival at the Hospital, meaning that their initial assessment was delayed. Of those, only 133(14.38%) were initially assessed by an ED doctor with specialist knowledge or interest in stroke care, while the remaining 792(85.62%) patients were initially assessed by a non-stroke specialist doctor.

	Medical interest/specialism of ED Senior Doctor (Consultant)			Total number of patients
		Other	Stroke	
Time since arrival at the Hospital to assessment by an ED Senior Doctor	>15'	792 (85.62%)	133(14.38%)	925
	<15'	198 (88%)	27(12%)	225

Table4.5: Relationship between the competence of ED consultant on stroke care and timeliness of initial assessment

System failure

In this stage of the pathway, the failure of the ED clerk to admit patients to the IT system was also observed (Figure 4.6. (F)). This was primarily attributable to the heavy workload placed upon the ED Clerk – who was required to admit multiple patients at the same time – and the unavailability of enough information from the patient or his/her relatives/friends when the patient was unable to talk.

Admission to ED

			Data source				
Variation type	Activity	Actors involved	Observations (Patient number)	Secondary data	Nom Interview quotes		Attributable factor
Unavailability of resources	Assess the patient at the front door	SNP/ED nurse	15 (2,6,12,14,15,18,19,22,26,39,40,41,44,47,50)	167 (14.52%)		-	Shared resources
			10 (1,3,6,10,12,20,38,43,45,50)	925 (80.43%)		-	
	Accompany patient to RD	ED doctors	9 (5,7,21,28,41,46,48,51,52)		15	“I personally feel that part of the challenge that we have is that although the ED sees the patient, it depends on who is on call in the ED. Some of them will prioritise stroke and some of them will not. Some of them the stroke patient comes in but then they have some other duties to attend to, so they leave the patient to go and do something else and then come back. And that is not very good for the patient.” (SD2)	
					16	“I do think it is the workload of the doctors and they have to prioritise other things over accompanying the patient to the scanner” (ED2)	
					17	“The ED has massive competing priorities. So, if you have someone who falls from a motorcycle - the stroke patient would not be a priority, you know they are competing. There is not sufficient spare capacity in the system. ED is at constantly full capacity all the time. Although stroke is important, it is not the	

						most important thing they are dealing with". (Interview round 2, RD consultant 2)	Scheduling & shared resources
					18	"ED has other competing priorities. So, in order to meet the 4hr you have to transfer the patient out of the ED to the ward. So, that will come ahead in theory of the stroke. So, if you look at the Government reports, they will talk about not meeting the 4hrs and being fine about it, but noone cares about the stroke care pathway" (SNP 2)	
					19	"There are cases that you have a stroke and a sepsis patient coming in and you try to persuade one nurse to do both. They will go to the sepsis patient because this is what they are familiar with. They are getting emails about it - what they do right and what they do wrong. Isn't it difficult to get people switch their priority?" (ED doctor 1)	
					20	"I think sometimes there are some problems with the system allocating doctors in ED, particularly if the SNP are involved and when the shifts are changed, sometimes they have difficulties in finding which doctor is allocated to the patient. I am not sure if their system always works at the moment" (SD2)	
	Brain imaging	EDA			21	"If you go to the RD with EDA, then EDA availability matters. It is all about the workload of the department really. If there is a problem with this process it has to do with the workload and availability of the staff" (ED1)	
		RD – ED staff/ SNP			22	"Overnight, it is unlikely to get a CT scan within 1hr. and if they are not thrombolisable sometimes the radiologist will say "How will that change your management?" (ED1)	
					23	"We try to do things as fast as we can and particularly in this case, provide CT scan to all the ED including stroke patients within 1hr. But currently, we have 17 radiologists and we have a workload for 30 radiologists and we pay £1000000 outsourcing. We do not have the staff to deliver this" (SR1)	

					24	“When you have 2 nurses trying to meet the demand of all the patients coming in, as well as trying to cover for all the sick staff in the department, then of course we are just understaffed in order to be able to go immediately down to CT with the patient.” (ED1)	
Communication issues	Pre-alert stroke team / Handover	ED staff/ Stroke team	8 (6,10,11,15,16, 26, 7, 12)		25	“If patients are in a phase that they cannot talk because they have had a stroke, and if there is no family or friend to verify their medical and behavioural history, this will make assessment much more difficult and could cause delays. We often rely on their information when diagnosing the patient. ” (SNP 1)	Patient issues
					26	“Well, sometimes as you know the ED staff do not always inform us. I do not know why this happens. It depends on the nurses who know that we are here, they see us all the time. I do not know whether they are just so busy with the volume of work and all the sepsis patients and all the other patients that also have pre-alert pathways. You know sometimes it just slips their minds.” (SNP 1)	Shared Resources
		ED staff/SNP – RD staff	8 (6,10,11,15,16, 26, 7, 12) 2 (38,43)		27	“ED staff forget to inform us (Radiographers). I just assume it is due to pressure and they have so many things they are trying to do... we often forget about communication for all the patients, whether they are trauma whether they are Fast (+).” (SR1)	
					28	“And problems with the CT scan and the radiology. At the weekend we have problems getting a scan booked because the radiologist is just rude and cranky. So, things like that do not help.” (SNP2)	Relational resources
	Request CT scan	ED staff/SNP – RD staff ED clerk	2 (38,43) 2 (24,28)			-	Shared resources

System failure	Patient admission into the system	ED staff – stroke team				-	
----------------	-----------------------------------	------------------------	--	--	--	---	--

Table 4.6: Description of variations observed in the patients' ED admission stage

4.3 Brain imaging stage

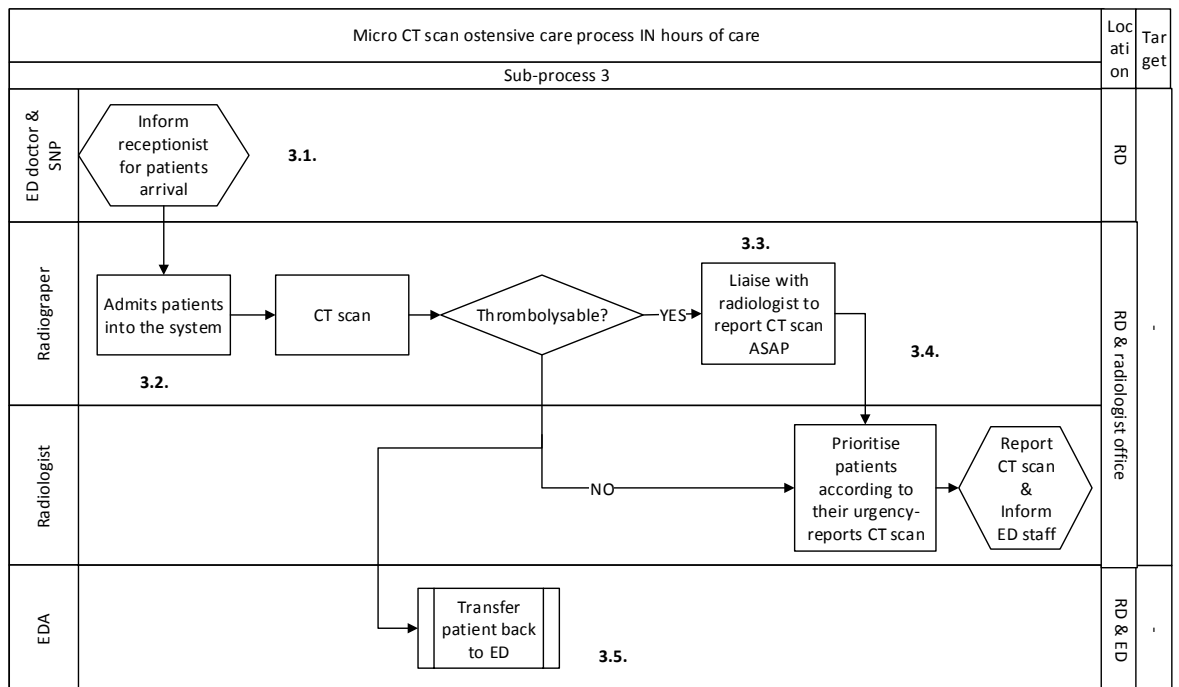


Figure 4.7: Description of the official version of patients' brain imaging stage
When a patient arrives at the RD, the SNP informs the Receptionist who lets the Radiographer know.

- 3.1.The radiographer should admit the patient into the RD system.
- 3.2.Patient should undergo CT scan. If the patient is potentially thrombolysable, the Radiographer should liaise with the radiologist to report details of the scan. The ED doctor should observe the scan results to inform the design of the treatment plan for the patient.
- 3.3.Radiologist should prioritise patients for CT scan according to the medical urgency of the patient's situation.
- 3.4.While the EDA and medical team transfer the patient back to the ED;
- 3.5. The radiologist should report the CT scan results to ED staff.

4.3.1 Variations of the Brain imaging stage

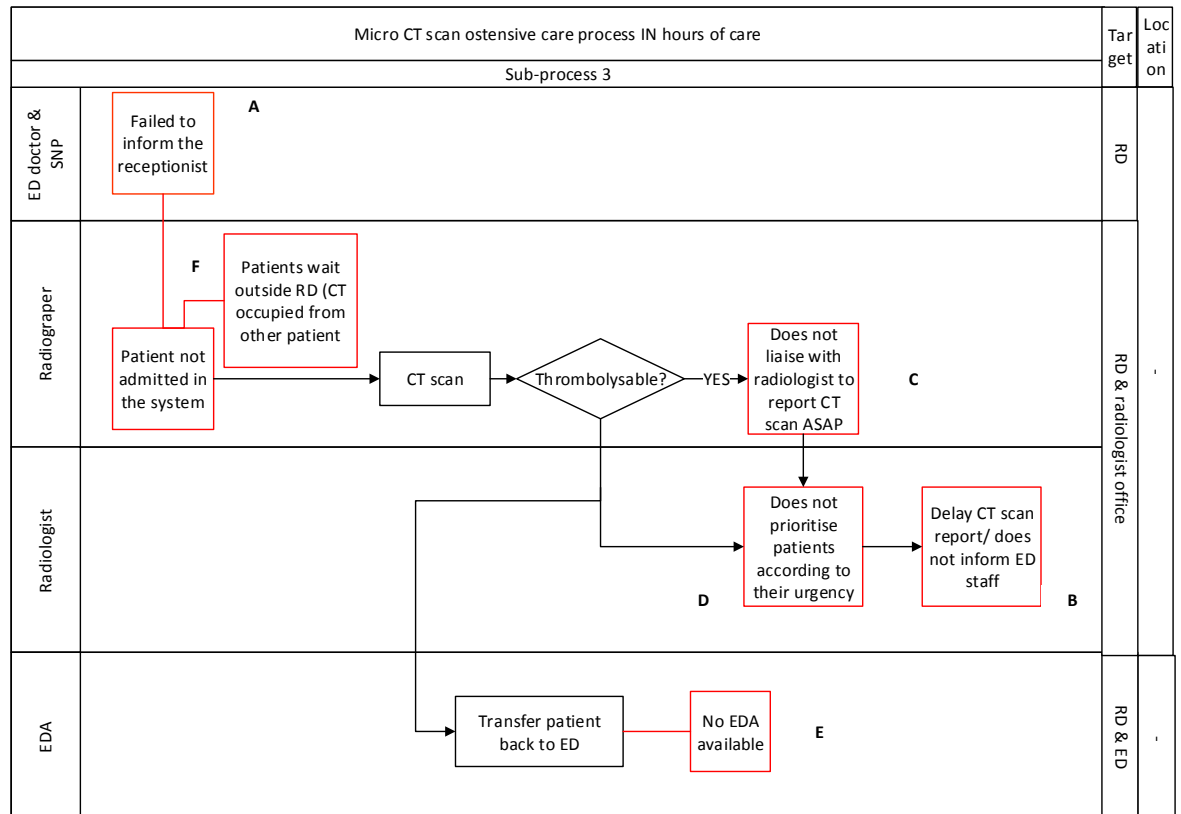


Figure 4.8: Variations of the patients' brain imaging stage

In this stage of stroke care pathway 4 different types of variation were observed.

Variations in communication

The most recurrent variations observed at this stage related to communications, for the exchange of administrative information between the practitioners involved in the process. In almost none of the instances observed, was the ED staff or SNP seen to inform the RD Receptionist at the arrival in RD (Figure 4.8. (A)). Similarly, the Radiologist was not seen to inform the ED staff by reporting on the CT scan results (Figure 4.8. (B)/ Table 4.5., 29). Although these steps in the process were included in the description of practitioner tasks recorded in the official process documentation, in practice the researcher did not observe them taking place.

Additionally, the Radiographer failed to liaise with the Radiologist to prioritise the CT scan reports of FAST+ stroke patients (Figure 4.8. (C)). Consequently, in these instances, the Radiologist was unaware of the need to prioritise the CT scan report for the FAST+ patient, leading to a delay in the results being reported, which is a variation, discussed in the next stage below (Figure 4.8. (D)). For example, one Thursday around noon, the SNP was assessing patient 8. Patient 8 was a middle-aged lady, who came in as a FAST+ referral from

her GP and had undergone a CT scan shortly afterwards. The ED coordinator had arrived, assessed the patient and asked the SNP to find the CT scan report in order for him to finalise his decision. However, the CT scan report was still not available, so the SNP phoned the radiologist and asked him to prioritise it. The radiologist replied: “Ohhh... is she a FAST+? I have not been told that. Okay, I will report that now”. The SNP, seemingly very frustrated, finished the phone call and explained to the ED coordinator what had happened. In this instance, the radiographer’s failure to inform the Radiologist of the FAST+ patient led to the delay of the CT scan report.

Such variations in communications could happen due to the business of the practitioners dealing with multiple group of patients at the same time (shared resources). This challenged the efficiency and effectiveness of their communication with the different professional groups:

“Sometimes there is a delay because we (the Radiographers) forgot to tell the Radiologist. When we get very busy and the communication site is lost” (SR1) (also see Table 4.5., 30)

Some other practitioners argue that communication issues were caused because of inefficient information or availability of artefacts to explain the process to them:

“There is no formal protocol on the wall saying what people should do with the steps. But, it should be clearly known to the radiographers that they should inform us when the patient is fast (+) or trauma” (RD senior doctor 2)

In any case, communication issues among the practitioners could result in variations to the process outcomes such as timeliness and order. For example, lack of communication with RD staff prior to arrival of the stroke patient may lead to a lower priority patient being admitted to the CT scan procedure shortly before the stroke patient’s arrival at the RD, enduring a delay before admission:

“There may be sometimes problems with the CT you know but it happens. If they have got patients already in there we have to take the next available slot and it is all about communicating with them to make sure that things happen” (SNP1)

Similarly, the Senior Radiologist added:

“Here in RD we had a few incidents where the phone call [from the ED staff] had not taken place. The first time that the Radiographer in ED knew that there was a patient to scan was when the ambulance crew had the patient outside the CT room, which was

actually locked. Because nobody had told us that there was a FAST+ patient on the way, so that we could go and open it”

While, in other instances, the process order could have changed:

“So, sometimes the Radiographers do not tell us. In that scenario patients go back to the ED, often the SNP or the ED coordinator will ring up after 15 minutes and will say “Have you had a look at that?” and I will say “Oh, I did not even know that that existed. Okay, I will do that now and then they have it in 5 minutes” (RD1)

(SNP1)

Communication failures could also occur due to system failures (i.e. patient information not available/recorded in the system) and vice versa. System failures could be caused by communication failures (i.e. patient information not available/recorded in the system).

Unavailability of resources

Unavailability of an EDA to transfer a patient back to the ED (Figure 4.8. (E)) was also observed in 3 instances, due to the fact that EDAs were busy carrying out other duties. Another contributing factor of unavailability of resources was the delays in CT scan reporting, because of the high workload of the radiologist. On occasions, as explained above, the radiologist may have to prioritise reporting the scan of another patient assumed to need more urgent attention:

“If it is delayed it’s because maybe the radiologist had a trauma patient to report, something more important” (SR) (see also: Table 4.5., inter. 32)

System failure

System failures were also observed. Typically, a system failure where the Radiographer was unable to admit the patient occurred due to failure of ED staff to request a CT scan electronically, and consequently the Radiographer could not admit patients to the RD system (Figure 4.8. (F)). In these instances, the patient would be delayed until the electronic admission had been resolved before undergoing the CT scan. For instance, one Wednesday afternoon, at 2:30pm, paramedics and the SNP arrived with patient 5 at the RD. Patient 5 was an older gentleman, 67 years old, brought in by paramedics, and admitted to the ED. At this point, the paramedics had no information regarding his name and age (this was discovered later). They said: “We found him in the street. The people who were around him said that it was around 1pm when he fell while he was walking in the city centre. He had no relatives or friends accompanying him to give us more information”.

The ED coordinator assessed the patient and identified stroke symptoms, then informed the SNP who was already in the department. The SNP quickly assessed the patient at the front door saying: “He should have a CT scan immediately. He is probably thrombolysable” and accompanied the patient to the RD. The SNP asked the ED coordinator to phone and inform RD staff. On arrival, the SNP went in to inform the receptionist about the arrival saying: “He is a FAST+ patient and needs to have his scan immediately”. The receptionist checked the system and replied, “I cannot see anything here, but I will let the Radiographer know”. The SNP seemed very anxious and could not wait outside, so she went with the Receptionist to the RD staff room. She repeated, this time to the radiographer: “He is a FAST+ patient and needs to have his scan immediately”. The radiographer appeared angry at this and responded: “You can bring him once the patient who is already in has finished his scan”. The SNP walked out and informed the patient and the paramedics that they would go in very soon. In this instance, the SNP’s inability to request CT scan electronically consequently created a communication issue with RD staff and delayed admission of the patient to the system. Since the RD staff had already begun the CT scan procedure for another patient, the FAST+ patient’s scan was delayed for some time.

			Data source				
Variation type	Activity	Actors involved	Observations (Patient number)	Secondary data	Nom / Interview quotes		Attributable factor
Communication issues	Inform Receptionist before and at patient arrival	ED staff/SNP-RD Receptionist	51 (1-25,28-52)			-	Shared Resources
	Radiologist liaises with ED staff	Radiologist- ED staff	52 (1-52)		29	“I would not necessarily ring them and say the report has arrived. So, for this system to work it relies on them keeping their computers refreshed looking for the report and checking to see if it has arrived. I need to work with many professional groups at the same time. I cannot do it all.” (Radiologist)	
	Radiographer liaises with Radiologist	Radiographer - Radiologist	10 (7,8,12,19,20,23,28,39,44,51)	Radiographer liaises with Radiologist	30	“So, sometimes they forget to tell us, the radiographers. Because they are working through their list and that is the manual bit. So, then I will see it on my list and I will report it. It is not normally more than one hour until we report something any way. But it might have to wait until I have two other scans to report and I just do them in order” (RD1)	
	Patient waiting outside the CT scan room	Patient	7 (5,13,21,24,42,46,47)			-	
Unavailability of resources	Transfer patient to ED	EDA	3 (9, 32,46)		31	“It is a high flow system and we (RD staff) used to fit people in and they (patients) would just turn up and would be fitted in. Sometimes, we might have an ITU patient on one scanner and biopsies on the other one. Both are timely scans. So, sometimes they would wait outside the room up to 10 minutes normally. In a rare scenario, they could wait 30 minutes. That is possible” (SR 2)	Shared resources & Communication issues

System failure	Patient admission in RD system	Radiologist	3 (5,16,24)			-	
-----------------------	--------------------------------	-------------	-------------	--	--	---	--

Table 4.7: Description of variations observed in the patients' brain imaging stage

4.4 The patients' ED medical assessment and decision-making stage

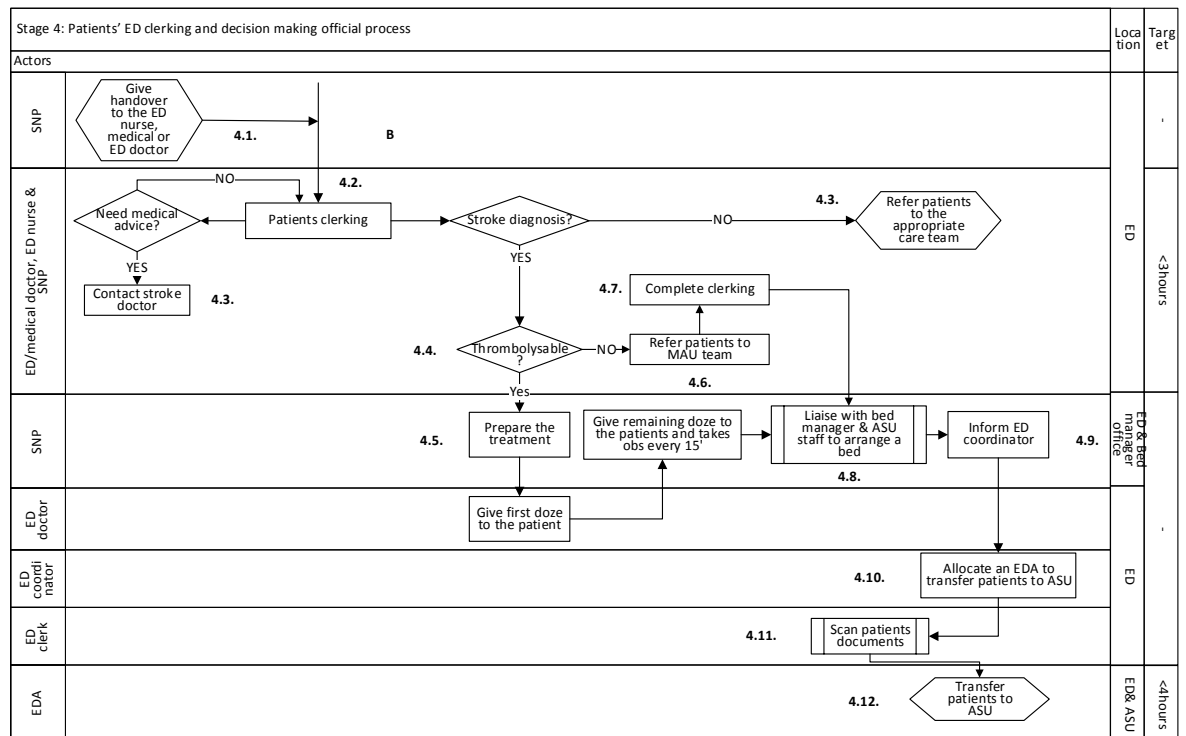


Figure 4.9: Description of the official version of patients' ED clerking and decision-making stage

During this stage of the care pathway, the patient returns from the RD and is transferred to the allocated bed in the ED. The SNP gives a handover to the ED nurse and MAU doctor (if the patient is a GP referral) the MAU doctor should already be there. If the patient is FAST+, the ED doctor should accompany him to the RD and back to the ED.

- 4.1. The medical team start assessing the patient (chest X-ray, check heart rates, swallowing tests, medication etc).
- 4.2. If medical advice is needed the ED doctor or SNP contact the stroke consultant on-call.
- 4.3. If the patient is diagnosed without stroke, then refer the patient to the appropriate care team.
- 4.4. If the patient is diagnosed with stroke and needs thrombolysis treatment, the patient should be thrombolysed within 3 hours of arrival at the Hospital.

- 4.5. The SNP and ED nurse prepare the medicine and ED doctors administer the initial dose to the patient. The SNP or ED nurse administer any subsequent doses and make medical observations of the patient every 15 minutes, for 1 hour
- 4.6. (D)).
- 4.7. If patients are not thrombolysable, the medical team completes clerking and refers the patient to the MAU team, in order for the MAU doctor to assess the patient as well (in some instances the patient may be transferred to MAU).
- 4.8. If the patient is not diagnosed with stroke, medical team refer the patient to the appropriate Hospital team.
- 4.9. After a stroke diagnosis has been made, and a decision taken to move the patient to ASU is made, the SNP (if available) liaises with ASU staff and bed manager to arrange a bed for the patient (by phone and electronically).
- 4.10. The SNP also informs the ED coordinator of the decision that has been made.
- 4.11. The coordinator allocates an EDA to transfer the patient to the ASU.
- 4.12. The ED clerk scans the patient's documents before they are moved out of the ED.
- 4.13. The EDA transfers the patient to the ASU.

4.4.1 Variations of the patients' clerking and decision-making stage

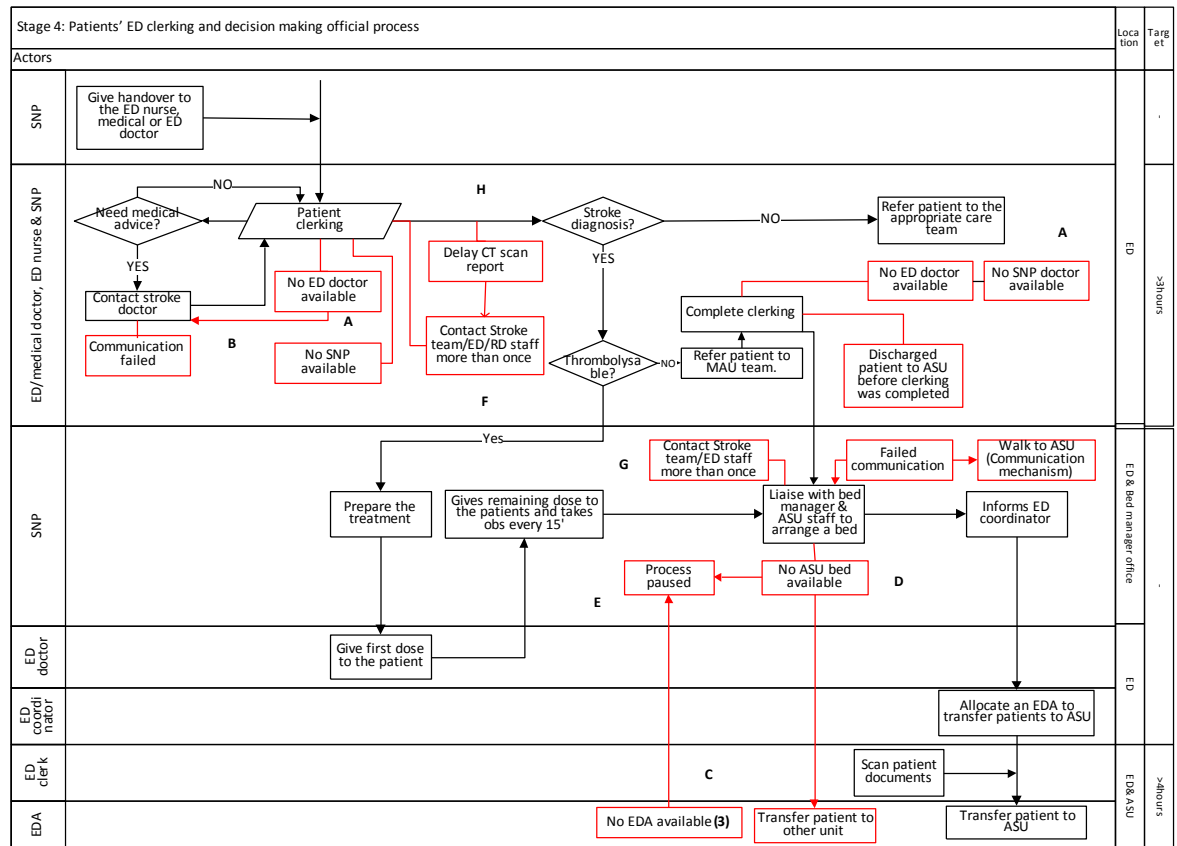


Figure 4.10: Variations of the patients' ED clerking and decision-making stage

In this stage 2 fundamental types of variation were observed; variations in availability of resources and communication. Variations in communication were divided into two different categories; communication for administrative information exchange and communication for co-operation where practitioners discuss and agree on the right medical plan of the patient (patient decision making process).

Unavailability of resources

Within this stage the most frequently observed variations related to availability of actors to carry out their tasks. In most instances of variations, the ED doctor, and/or the SNP and/or ED nurse were not available to initiate patient assessment (Figure 4.10 (A)), complete patient clerking (Figure 4.10 (B)). Similarly, EDA was not available to transport the patient back to ED (Figure 4.10 (C)). This issue was partially due to the scheduling system of the hospital and consequently, practitioners being physically unable to carry out high quality care:

“I think that the level of care that our patients require is because they are very dependent on the nurses. They might be confused, they do need a certain level of nursing care which is

very clearly indicated in the national guidelines. But, none of us is able to meet the required level. There are not enough of any of us. We are all very stretched. So, yes, the nursing levels of care are not optimised - they could be much better” (SN2) (see also Table 4.6.: inter. 33-35)

The practitioners involved might have been busy administering care to other patients, or having other attendant duties to perform:

“...if many patients come in at once, you cannot get the whole pathway for all of them but, you can do certain things for all of them.... (SNP 2) (see also Table 4.6.: inter. 33-45)

The stroke team suggested that the ED staff prioritised the care of some other patients above stroke patients. In those instances where ED staff were not present to assist with the care process, the tasks allocated to the ED staff were carried out by the stroke team:

“It Depends on who is on duty, as you saw today. I did all the clerking, the doctors did not get involved” (SNP 1) (see also Table 4.6.: inter. 37-45)

However, members of the stroke team such as SNPs were not always competent enough to carry out their duties as effectively and efficiently as the doctors:

“Many times, not having an ED or stroke consultant available with you to assess the patient and make that decision can delay the process. I can assess the patient, but I cannot make the final decision on my own” (SNP2)

Unavoidably, this resulted in the process being paused and delayed.

Some of the practitioners argue, that practitioners’ decision to carry out their tasks varies between professionals of the same group. Not all the RD staff had the same motivation to carry out stroke care:

“No, it’s very variable between ED consultants and I feel that since we started, some of the ED staff seem to have taken a back seat when it comes to stroke. They let us sort of steering the process. While I think the patient should be our centre of attention. I should not need to tell them what they should do.” (SNP 2) (see also Table 4.6.: inter.46)

While other practitioners explain variations in the availability of actors happening due to differences in professionals’ departmental goals and interests:

“So, from the ED nurses the comments that you get is that: “You are not the only priority”. Which proves exactly that there are multiple priorities. If you look at the GG

plan, they have a 5 years' plan and then an annual year of plan for 5 priorities to spend money on and stroke keeps falling and falling. And now they have a new kidney theme but they are still aware that it is important. It is just that they do not prioritise it. ED knows that is important but they do not know how to prioritise it really. That is why they need us; that is why they leave it to us.” (SNP 3)

This impacted their motivation to engage stroke care, resulting in a negative effect both for the pathway and the patients:

“We do not consider the 2nd or 3rd consequences from any target...the government told us which patient to prioritise - which is not actually the best thing to do” (SR 1)

Moreover, unavailability of resources such as medical equipment and beds was observed (Figure 4.10 (D)). These variations in resources usually led to the process being paused (Figure 4.10 (E)) and admission to ASU being delayed, or, alternatively the patient was admitted to a different unit (Figure 4.10 (F)). One of the stroke nurses noted:

“Usually there are problems in finding an ASU bed. There is no bed available and you try to sort out a bed, and if there is no way to locate a bed, this will cause significant delays”.

Stroke bed capacity shortages were an outcome of three main issues. Firstly, staffs' lack of competence on stroke care could lead to wrong decision making and consequently, non-stroke patients were admitted in the ASU using the available resources:

“Out of hours, where the medical team thought that there were chances that the patient had had a stroke but they had not and were wrongly admitted to the units” (SNP1) (also see Table 4.6.: inter.48)

Secondly, in various occasions, stroke beds were used for other patient groups because of bed shortage in the other hospital wards:

“Quite often there were OPU or other non-stroke patients on the ward ... I do not think that we were ever without OPU patients in the six months I am working here. There will always be at least one non-stroke patient on the ward and now I think we have three” (SD 2)

Similarly, ED nurse added:

“But you know, when ED is full and has people in the corridor, keeping a lot of empty beds in case someone comes in with a stroke is a luxury. We may require these beds to

be taken by other non-stroke patients, because this is a luxury that we cannot afford because ED is unsafe” (also see Table 4.6.: inter. 49-53)

In one of the evaluation reports (April – June 2015) the following excerpt appeared:

“Today we scrutinised the notes of all patients in the stroke unit. Of the 26-bedded area, there were 19 stroke patients. There were five non-stroke patients in the hyper acute bay”

An additional pressure on availability of beds within the ASU came from delays to the discharge of patients, due to other factors outside of the ASU practitioners’ control, which nonetheless influenced availability of stroke resources taken on one of the observed days, shows the white board in ASU displaying all the patients present in the ASU that day. The picture illustrates that two of the patients (all green buttons) were clinically able to move out, but had their discharge delayed. Delays related to discharge of patients are caused by internal capacity constraints:

“During off-hours of care there are less doctors working in the hospital and there are less discharges.” (ED doctor 3) (also see: Table 4.6.: inter. 54)

But also, due to factors that were not under the control of the participants themselves:

“We (stroke nurses) ring up the community hospitals [and tell them] that we need beds and they do not have discharges happening. Transport is also a problem and we’ve had failed discharges because of transport. So, these really affect the process” (SNP 2) (also see: Table 4.6.: inter.55,56)

Cons	EDD	MSTD	PT	OT	Disc. Ref.	Area	Disc. Dest.	Patient Safety				
HELEN												
LS	8/5					B	H ₂ O	C				
LS	6/5					S	H	C				
LS	1/6					S	H ₂ O	C				
LS	2/4					W	CH	C				
LS	5/3					W	CH	B				
LS	4/5					W	CH	B				
HELEN												
LS	7/5					W	CH	B				
LS	11/5					TBC	TBC	B				
LS	1/6					B	H ₂ O	B	C			
LS	6/4					S	H ₂ O	C				
TTAS	TRAVEL	TIME	TOC	D/S	FOLLOW up	RELATIVES involved	IFT	DISCHARGE info	DISCHARGE INDEX	Discharge Index	D/C diary	

Picture 4.1: The ASU white board showing patient load

Secondary data analysis revealed that 1123 (97.665%) patients were discharged from the ED more than 15 minutes after the time of the decision to admit them had been made. A further 442 (38.43%) patients were discharged from the ED to the ASU more than 4 hours after their time of arrival at the Hospital, while 185 (16.09%) patients were admitted to another Hospital unit, rather than the ASU.

Unavailability of resources due to shared dependency with the other patient groups, was also observed to impact the process order and timeliness. On numerous occasions the researcher observed that patients were leaving the ED before their medical assessment had been completed. Patients either had their CT scan and/or swallowing test after leaving the ED. For instance, patient 51 arrived at the hospital at 12:37pm in the afternoon. The ED coordinator did not inform the SNP, but the SNP learned that the patient had been admitted while carrying out her regular ward round. The SNP began clerking the patient and requested a CT scan. While the SNP was obtaining a blood sample from the patient the ED coordinator came to her and said: “Did he have a stroke? Are you going to take him?” SNP replied: “Probably, but he has not had his scan yet. However, from his notes I suspected it was a stroke patient.”. ED coordinator replied: “Can you take him now? We need to empty beds now, there are patients waiting in the corridor”. The SNP finished recording the clerking results and took the paperwork to the ED Clerk to scan them. The ED coordinator allocated an EDA to take the patient to the ASU, and once the papers were scanned, together with the

SNP, the EDA transferred the patient to the RD where he underwent a CT scan before proceeding to the ASU. Thus, in this instance, the patient was discharged from the ED, before the CT scan had taken place, in contravention of the formal process documentation.

Variations in communication

Administrative information exchange

Significant variations were also observed in the communication routines of practitioners for administrative information exchange. Whilst all of these variations stemmed from issues with communication, they impacted the care process in different ways, and consequently the researcher placed them into 3 sub-categories: frequency, timeliness, mechanism (Table 4.6.). The researcher observed that, particularly during busy periods, there was an increase in the frequency of exchanges of administrative information by medical personnel, but that perhaps this was due to a decrease in the accuracy of communication. In transferring the same information, multiple times to different practitioners, important parts of it may be lost, or forgotten, potentially impacting on patient care and causing medical errors. For example, SNPs were required to provide the same handover information more than once; ED seniors and/or stroke doctors needed to “refresh their memory” about a specific patient before proceeding with his/her care (Figure 4.10 (G)). It was very common to observe that when SNPs were assessing a patient and there was no ED doctor available to assist them, they needed a doctor to make a judgment on the patient’s medical tests in order to proceed with the care process. Consequently, the SNPs spent time walking around in the ED, finding doctors who were available to assist them, providing a handover for the patient and asking the ED doctor to review the medical test. That sequence of events might recur with 2-3 different ED doctors, for different medical tests, for the same patient. Consequently, the handover information for the same patient was exchanged multiple times with numerous practitioners. The same increase in communication frequency was also observed when the SNP tried to arrange a bed for the patient, either within the ASU and/or via the Bed Manager (Figure 4.10 (H)).

Similarly, during this stage the SNP or ED staff were observed multiple times contacting RD staff, or other departments providing test results (i.e. blood analysis), to ask them to prioritise results and reports when these were not available:

“Sometimes, you are waiting for results before thrombolysis. For example, if they have had their blood test, you need the results to come back and if they do not, that is a problem and you need to contact them again and again. Sometimes I had to ring the blood

department and say: "I am waiting for these results - can you hurry up with these basically?" (SNP2)

On two separate occasions, it was also observed that the ED doctor phoned the RD staff more than once in order to discuss a CT scan report, since the ED doctor had a different medical opinion regarding the report. In some instances (13) the researcher observed that communication between the practitioners was either late or involved failures (Figure 4.10 (I)). They were particularly evident when the SNP or the ED staff tried to contact the stroke team, either to seek medical advice or to arrange a bed. These communication variations led to the emergence of different communication mechanisms: for instance, practitioners were walking to the relevant units to communicate with colleagues. It was observed on numerous occasions that when communications with the stroke team failed to take place, the SNPs adopted different mechanisms to exchange information with their colleagues:

“So instead of waiting for them to answer the phone when I ring them, I often run down here to talk to them because the phones are not being answered. So, it’s difficult.” (SNP 1)

These variations’ in the communication of practitioners for the exchange of administrative information was mainly observed when the practitioners were busy, dealing with the care of multiple other patients admitted to the hospital (sharing their resources with multiple patient groups):

“The CT scan report is not always down there in a timely manner because the CT scanner is full and then out of hours is different to the day and there is a risk that they won’t be reported rapidly. And then at anytime situations may arise and the patient won’t be prioritised” (SD2) (see also: Table 4.6.: inter. 58,59)

or because of hospital scheduling issues:

“There may be fewer ward staff at the weekend. There is no ward clerk and there is no ward MNP, so we need to rely on the ward staff to liaise with. So instead of answering the phone when I ring them, I often run down here to talk to them because the phones are not being answered. So, it’s difficult.” (SNP 3) (see also: Table 4.6.: inter. 60,61)

Communication for co-operation

Variations were also observed in the communication of participants for the decision-making process. On various occasions the stroke doctors and ED staff were observed having communication problems when deciding the patients’ diagnosis and treatment. This might

have happened because of specialised staff capacity and scheduling issues. The workload of the present staff was increased – carrying out multiple tasks at the same time, making the decision-making process more challenging:

“So, you can see how difficult it is when I am overseeing two wards, and someone suddenly calls me to go to A&E - our rota is very, very very tight. We cannot do everything on time” (SD 2) (see also Table 4.6.: inter. 62,63)

Moreover, the findings of this study illustrate that between the ED staff known to have a particular competent stroke care, communication was observed to be faster and more effective:

“If you have, for example somebody like X (ED doctor interested in stroke care) to run this pathway, it his baby, it is his thing to drive the care of stroke patients. I am sure he is probably better at getting things done compared to the rest of us. And some people are more convinced about the evidence of the thrombolysis compared to others - and that impacts decision making. I am sure it will” (ED doctor 2)

“I feel that some of the ED doctors do not agree with the stroke doctors. Some of the ED doctors do not tend to believe thrombolysis for stroke as such and they think it is not the best thing for the patient. It is controversial. Thus, when it comes to decision making, there are some cooperation issues there. It does not help when we want to get the treatment for the patient and they are not convinced by the data or, you know, have other concerns. This delays the process.” (also see Table 4.6.: inter.64,65)

While, when practitioners were less competent on stroke, their communication on decision making seemed to suffer, creating considerable delays to the care process:

“The one (ED senior doctor) today is a very junior registrar and she happens to be excellent, but actually her experience is limited. If she was on duty during the night and had none to confer with, it would be likely that she would be slower because she would want to consider more factors.” (ED doctor 1)

This claim was also supported by the observations of the researcher, as there were no instances observed where non-stroke care motivated ED staff were in charge of the patient, and were present to support the SNP through the whole process. Rather, these ED staff would frequently interrupt the process to deal with the care of other patients, leaving the SNP alone.

Moreover, an analysis of the secondary results (Table 4.6.1) shows that the stroke care competence of the ED doctor was also related to the time that elapsed between patients' initial assessment and the point at which a decision was made about the patients' individual care path. From the total stroke patients' population at the Hospital, 969 received an initial diagnosis of stroke more than 90 minutes after their time of initial assessment and 840 (86.67%) of those were assessed by a non-stroke specialist doctor and 129 (13.3%) by a stroke specialist. Although other systemic factors may have impacted on the timeliness of the decision-making process, there is an obvious difference between the doctors' competence in stroke care.

	Medical interest/specialism of ED Senior Doctor (Consultant)			Total number of patients
		Other	Stroke	
Time from assessment to decision making	<90'	150 (82.87%)	31(17.13%)	181
	>90'	840 (86.7%)	129 (13.3%)	969

Table 4.8: Relationship between the interest/specialism of ED senior doctor in stroke care and time from initial assessment to final decision made

Additionally, communication within the decision-making process of practitioners could vary because of artefacts being unavailable to inform practitioners on how to implement the process:

“We do not have a clear defined pathway. And that makes a huge difference for the ED staff to know what to do and how to thrombolyse” (SNP 1)

as well problematic relationships between them:

“I feel that I have a very different relationship with the bed manager and site manager than the others on the ward. I think you will get a different answer from the junior staff because of my role and because of what I do, they (the bed managers) respond very, very differently to me. And I know this is a concern that my other colleagues have” (see also: Table 4.6.: inter. 69)

Practitioners of the same professional groups were observed communicating and working better between themselves.

Some of the practitioners argue that variations in communication could be explained based on the frequency of staff meeting taking place between the professional groups:

“If you have a formal meeting every month, to meet and discuss the positive and negative aspects of each case, this helps us to improve and is beneficial to all. For example, we set a meeting with the radiologist to discuss numerous cases and what the patient outcome was. Before this input was available it was increasingly difficult to monitor and follow up on each patient. Now, it serves as a good update and reminder, with staff commenting “I will remember your presentation now”. It is a way of connecting and interacting with people.” (SD 2) (see also Table 4.6.: inter. 70)

It was interesting to see that practitioners from the ED were not attending any of the staff meetings regarding the stroke care process. In general, professional groups involved in the process had limited interaction with them to discuss and share their opinions regarding the stroke process which seemed to impact the outcome of their collaboration.

Medical assessment & Treatment / Decision Making							
			Data source				
Variation type	Activity	Actors involved	Observations (Patient number)	Secondary data	Nom / Interview quotes		Attributable factor
Unavailability of resources		SNP	6 (2,11,15,16,17, 41)		34	“last time, 3 people were admitted in 2hrs in the emergency bay and they needed more care. Their needs are more intensive when they first come in and it is hard to do everything when I am admitting them, medicating them and dealing with/supporting their relatives. That is why it is hard when you are short staffed.” (Stroke Senior Nurse 1)	Shared resources
Actors not available		ED staff (Doctor / Nurse)			35	“...if many patients come in at once, you cannot get the whole pathway for all of them but, you can do certain things for all of them.... (SNP 2)	
					36	“Maybe it has an impact on the smooth running of the department. because if it is really, really busy and everybody is stretched in different directions you may not be able to get your patient seen by the doctor. The doctor could be doing 2 things at once, so that may cause a delay to the smooth running of the department “.	
					37	“I think the ED staff leave the SNPs to do everything ... I had to leave the ward round the other day because there was no doctor available to help SNP to clerk the patient in ED” (SD 3)	
					38	“let's say that the patient is sick as well as in need of stroke care and you need to do multiple tasks. Before you know where you are, you find that you are the only person there by the bedside; everyone else has left and you discover that you need to book a CT. Firstly,you have to assess the patient, which may slow things down because, if you are the only person available, then you may find that you are overloaded with work.” (SNP 3)	

					39	<p>“I would say ED nurses, probably mostly, get involved but, sometimes if they know we go in, they do not. Which is wrong because we are not supposed to go down there and take over the patients. That is not what we are supposed to do. We are very good in facilitating the pathway but, in order to do that, we have sometimes been left on our own to do the nurse’s job, doctor’s job - all of it. And you cannot get it all done; all the nurse’s work, all the doctor’s clerking and facilitate the pathway, facilitate the bed. Because 4 hours is not really long, by the time you book the scan and come back from the CT, it takes time to go through all the questions and interruptions, especially if you have very junior clerking skills” (SNP 3)</p>	
					40	<p>“Sometimes I feel that they do not see the stroke patient as such as a priority. And I have to say, ‘Can you look at this patient?’ Because they have different patients, different priorities. Everything is time critical, and it is difficult to switch everything on and manage everything on time especially when you have two or three patients who come in at the same time. They all have critical interventions and observations and fluids. It’s very hard for them to focus on everything and do everything on time” (ED2)</p>	
					41	<p>“I think there is a problem here as well. The ED staff leave the SNPs to do everything, whereas actually they are not doctors - although they are quite good. But, I had to leave the ward round the other day because there was no doctor available to help SNP to clerk the patient in ED and I think the ED doctors sometimes say: "okay there is an SNP so, we do not have to do anything". But, the SNP should be on top, should be liaising with the team in ED and the ward getting things ready, and making assessments. But, ED and the medical doctors still need to be very much involved and I think sometimes they are not enough.” (SD2)</p>	
					42	<p>“It is amazing to see that when a trauma or sepsis patient comes in, everyone disappears”. (SNP 2)</p>	
					43	<p>“I think what we have to do is that when we are there, ED staff do not get involved in the process to do their bit. So, if they get involved and do all the things that need to be done now, then we can get the patient and go.</p>	

						“But, they always say I have to do this for this patient, and to do this for that patient. So, you know, there is a mentality of safety, something to be done, but not necessarily what needs to be done.” (SNP 3)	
					44	“And there are occasions when I go to the ED as a stroke doctor, especially when there is no SNP, I just want to disappear. You find yourself alone, there is nobody around and you just need a bit of help. And they just say “I have a trauma, I need to go You are the stroke physician, you need to deal with it”. And it is really difficult.” (SD 2)	
					45	“Yeah and I think again nursing wise it depends on who is on. It matters who is there, I think Y who is involved in a lot of projects related to stroke and she is aware of what the priorities are. the level of awareness of importance and priorities of stroke down there is patchier for the nurses in the ED.” (SD 3)	
					46	“There are some ED doctors who are extremely good and they will manage when the patients come in as well as any stroke physician I know. But I know that they are passionate about stroke ... they love stroke but not everybody is like that” (SD2)	Staff competence
					47	“So, from the ED nurses one comment that you get is that: “You are not the only priority”. Which proves exactly that there are multiple priorities. If you look at the GG plan, they have a 5 years’ plan and then an annual year plan for 5 priorities to spend money on and stroke keeps falling and falling. And now they have a new kidney care pathway but they are still aware that it is important; they just do not prioritise it. ED knows that it is important but, they do not know how to prioritise it really. That is why they need us. That is why they leave it to us.” (SNP 3)	Organisational targets and goals
<i>Bed not available</i>	Patient transfer	EDA	2 (26,43)		48	“The odd patient that comes in here is not a stroke, but it is thought that they could be a stroke because out-of-office-hours staff may not have stroke expertise. A stroke consultant could have assessed the patient over the telephone, but this can be complicated without seeing the patient.. So, occasionally you have patients coming in that are not stroke.” (SNP 2)	Staff competence

	Bed arrangeme nt	ASU team	10 (7,8,9,12,17,18 ,19,24,28,45)	49	“Now it’s quite tricky. We are on black escalation (no beds available in the whole hospital) at the moment so it’s really hard to maintain a bed for the stroke patients” (SNP 1)	Shared Resources
				50	“Because of the amount of pressure on the trust for hospital beds, it runs at over 95% bed occupancy and there are very few available in the hospital at any point in time. So, it is usually a question of moving somebody out of one to create a free bed and then moving them back if somebody needs to be discharged. So, there can be significant delays at that point.” (SD 3)	
				51	“And then their may be delays getting the patient into the right bed, in the stroke unit. So, the risk of delays increases during out of-office-hours due to the fact that there is not a designated member of staff available to steer the process during this time.” (SNP 1)	
				52	“It is not a high flow system. Patients used to turn up and they would fit them in. Sometimes, they might have an ITU patient on one scanner and biopsies on the other one. Both of them are timely scans. This is not a usual scenario but is possible. So, sometimes they will wait outside the room. That is possible.” (RD consultant 1)	
				53	“I do not want more beds, I want more people GOING OUT. There is 1/3 of the people in the hospital that do not need to be there. They need to be in social care, they need to move. Shift them out and we will be fine. It is a very simplistic idea, but we have got beds that people could move in.” (ED 2)	
				54	“During the weekend ED is very busy because there are fewer doctors working in the hospital and there are fewer discharges. And so the hospital tends to fill up.” (ED 2)	
		Social care/ transport	9	55	“We have imminent discharge problems. Transport is also a problem and we’ve had failed discharges because of transport issues.” (SNP 2)	Others
				56	“And then we contact the community hospitals requesting beds and they do not have discharges happening and that affects us too.” (SNP 2)	

Communication issues		SNP-stroke team	13 (7,10,12,20,22,24,28,38,46,47,48,49,50)		58	“You see one would say: "why aren't they more proactive at seeing the patients when they come in?" Their workload on the ward may be the reason. They could be discussing a patient's issues with their relatives, which could delay them from ringing me by a 1 or 2 minutes. With their workload, that is understandable. .Because they cannot just drop everything during that session to tend to something else Dr Y is very good at answering the phone immediately when the stroke nurses contact him and also going to the ED to assist them when necessary. (SNP 3)	Shared resources
<i>Frequency</i>	Patient assessment						
	Report of CT scan/ other medical tests	ED staff/SNP – RD staff	8 (8,9,10,20,28,37,38,47)			-	
<i>Timeliness</i>	Patient assessment	ED staff/SNP-stroke doctor/ RD	8 (8,10,19,20,24,45,47,48)		59	“But, the problem I have in terms of speeding up the process if I speak to the consultants and say: "look we have a Fast (+) coming in 10' they will say, “Oh, just let me know when you are on CT and I will come down". But if I want to get things moving and they come down and they get talking to the outreach or the ED consultant, I feel like the more people who get involved in making the decision, the longer it takes to make the decision.” (SNP 2)	
	Bed arrangement	SNP – bed manager	9 (7,11,12,28,41,48)		60	“It is more stressful when I have to locate a bed to put a patient in and I find that we do not get enough support from the side team. They do not practice, they are not active; you have to bleep them and then they do not answer the bleep. Then, I cannot leave the patient. Meanwhile I have to keep staff busy looking after the patient. I can continuously bleep the side manager and say:" you know we have a bed full of sick patients, we only have got a lady that we can move from the stroke ward so..." (SNP 3)	Scheduling
		SNP-Stroke team	7,10,11,12,19,24,27		61	“The SDs here are obviously looking after the ward and they have got their clinics, they have got outpatients clinics. But, the problem I have in terms of speeding up the process if I speak to the stroke consultants and say: "look we have a Fast+ coming in 10' they will say “Oh, just let me know when you are on CT and I will come down". But if I want things	

						moving and they come down and they get talking to the outreach or the ED consultant to get information because they were not there from the beginning, this can delay the process” (SNP 2)	
Communication issues for cooperation issues	Decision making	Stroke doctor - SNP Stroke team – ED staff			62	“So, we follow the same pathway in-office-hours and out-of-office-hours but, we have got more decision makers in-office-hours to make the pathway work.” (ED coordinator)	
					63	“It is difficult for someone who is not from here. It is not clear how their system runs and there is no easy way to identify who is looking after the patient. So, if I go to see a patient on a particular trolley, I do not know how to find out who the nurse or doctor is who is looking after him. I do not know how they work there but, it is not clear as it is here where you know who manages which bed all the time. That might cause issues regarding communication because it is not clear with whom to liaise. I try to go to the nurses around and ask them but I am not sure if they are the right nurses looking after the patient.” (SD2)	
					64	“Experience is one factor, as is people’s values. For example, there is a consultant who is extremely good, and he will manage the patients when they come in as well as any stroke physician I know. But, I am aware that he is passionate about stroke, he loves stroke - but not everybody is like that.” (SD 1)	Staff competence
					65	“I feel very safe that we have somebody who is an advocate for stroke in ED and I think that when he is there, the patients receive the right care. When he is not around, the quality of care can be more variable. There are different levels of understanding, knowledge and skills regarding stroke care.” (SD 1)	
					66	“I was not happy to thrombolyse without first having a chat with a stroke consultant. I did not feel safe deciding on my own. And we made the decision together.” (ED doctor 3)	
					67	“Usually the ED staff would speak to someone in ED. So, if it was one of the registrars would ?? feel that they should call the stroke consultant	Relational Resources

						because it seemed appropriate. But, we might just discuss it by ourselves.” (ED doctor 1)	
					69	“It is the ED doctor who should assess the patient, but we can also alert our stroke consultant, because our stroke doctors have more experience about thrombolysis and patient outcome than ED doctors. So, we might sometimes feel all this is tricky and we prefer to call them” (SNP2)	

Table 4.9: Description of variations observed in patients' medical assessment and decision-making stage

4.5 The patients' admission in ASU stage

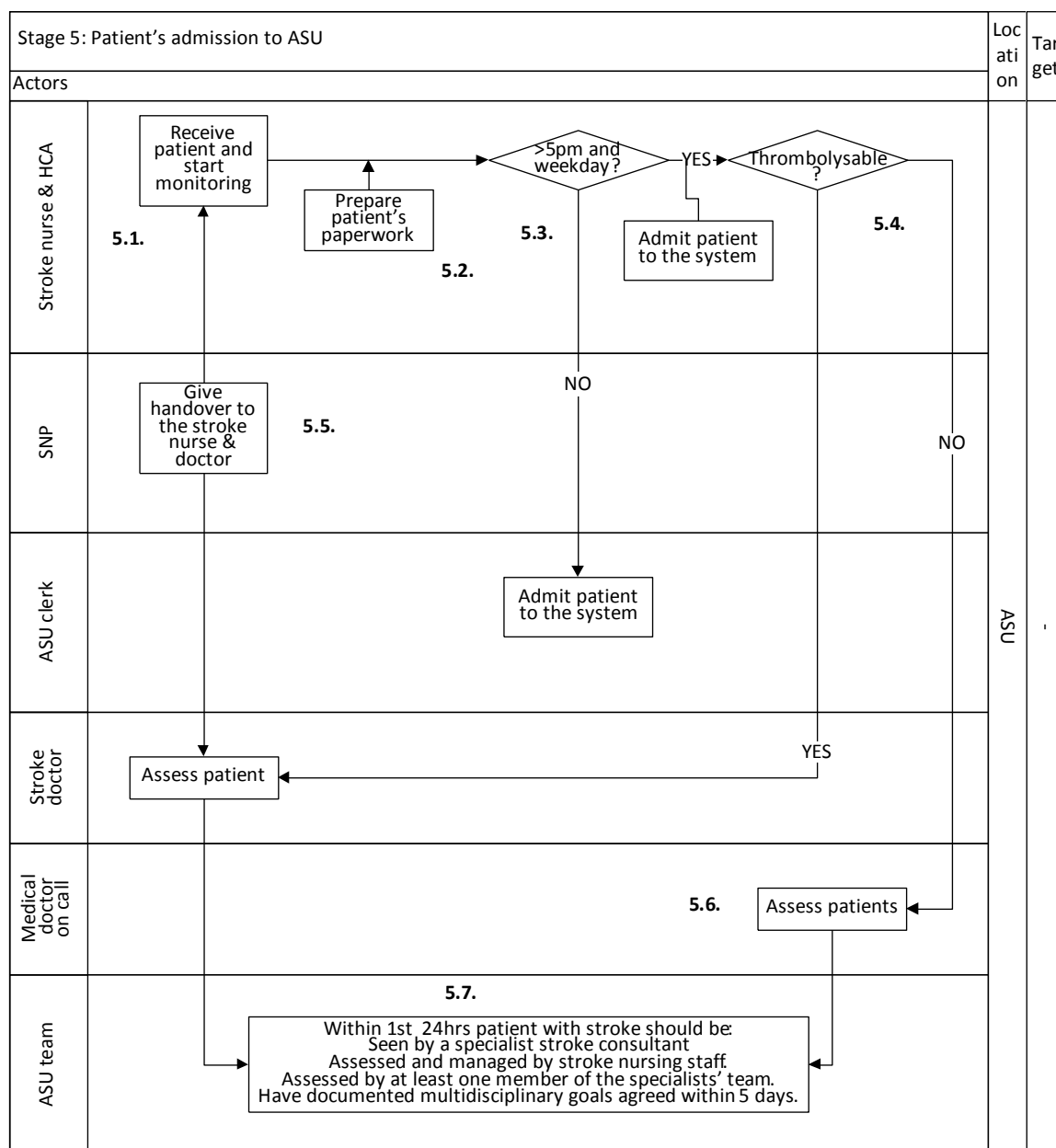


Figure 4.11: Description of the official version of patients' brain imaging stage

Patient arrives in the ASU and is initially admitted to 'D-bay' (high-dependency care area). The stroke nurse and healthcare assistant (HCA) receive the patient, and initiate monitoring procedures (e.g. check blood pressure etc).

- 5.1. Stroke nurse should prepare patient's paperwork.
- 5.2. If patient admission begins ASU before 5pm, the ward clerk admits the patient to the IT system, after 5pm the stroke nurse should assume this responsibility.
- 5.3. If the patient is thrombolysed and admitted before 5pm, the stroke doctor should assess them, and after 5pm the MAU doctor should assess the patient within 2 hours

or alternatively the ASU team should request that the doctor from MAU assess the patient.

- 5.4. Once the patient has been settled in an ASU bed, the SNP should deliver a handover to both stroke nurse and stroke doctor in charge of 'D-bay' patients.
- 5.5. Stroke doctor or MAU doctor (if patient is admitted in the ASU after 5pm) should assess the patient within 15 '.

4.5.1 Variation of patients' admission to ASU stage

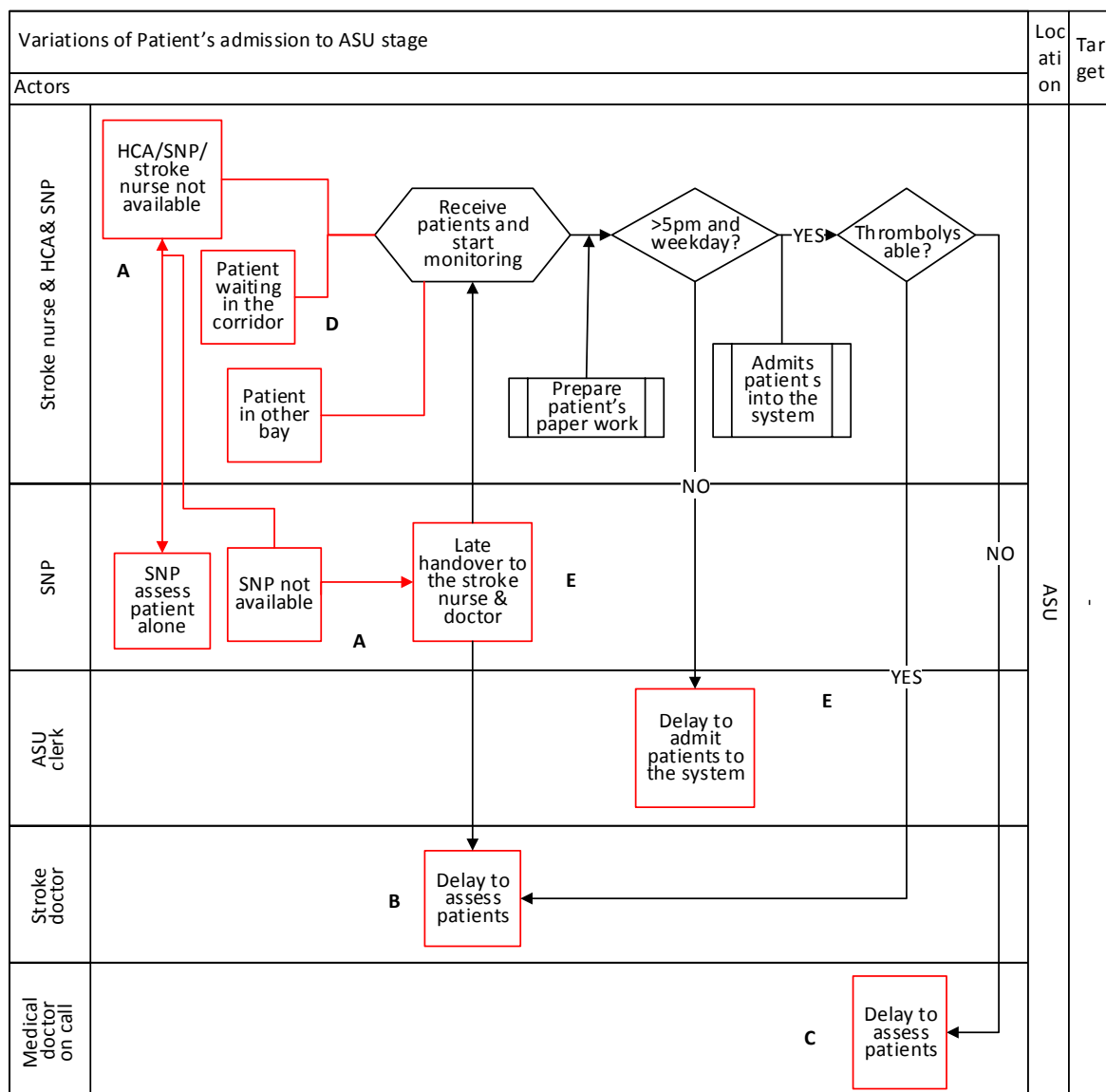


Figure 4.12: Variations of the patients' admission to ASU stage

In this stage 3 different vital types of variation were observed. Table 4.7. summarises the types of variation.

Unavailability of resources

The most frequently observed variation within stage 5 was the unavailability of the SNP to accompany a patient to the ASU (Figure 4.12 (A)). This usually resulted from the SNP being already engaged with assessment other patients in the ED. In the case of patient 29, a 45-old woman, who arrived at the ED Reception, one Thursday morning at 11am in a wheelchair, accompanied by her daughter. The patient's daughter explained to the Receptionist: "I was clearing the garden and when I came back I just found her like this. I was talking to her and she just looked around like she did not understand anything. I got so scared, so I immediately brought her here". The ED Receptionist informed the emergency nurse practitioner (ENP), who assessed the patient and identified stroke symptoms. The ENP informed the ED coordinator who then informed the SNP. The SNP assessed the patient and, after a discussion with the stroke team on the phone, a decision was taken to admit the patient to the ASU. The SNP requested, through the IT system, a bed for the patient in the ASU and proceeded to inform the ED coordinator of the decision. At this point a FAST+ stroke patient was pre-alerted by the ambulance crew paramedics. Consequently, the SNP went back to patient 29, completed the patient's paperwork and said to the ED nurse: "Can you please walk him to the ASU? A FAST+ is coming and I cannot leave the department?" The EDA arrived and, with the ED nurse, took the patient to the ASU. In this instance, the SNP was not able to accompany the patient to the ASU due to a more urgent need to attend to the pre-arrival pathway stage of a pre-alerted patient en route to the Hospital.

The researcher additionally observed 3 instances where the HCA and/or stroke nurse were unable to receive a patient and initiate monitoring immediately (Figure 4.12 (A)). In these instances, the SNP moved the patient to a bed with the assistance of the EDA and initiated the monitoring process until the stroke nurse was available to take charge of the patient. The primary cause of this variation was that the stroke nurse and/or HCA were actively engaged with caring for other patients in the ASU:

"It may take a while to bring the patient in to ASU. Sometimes the nurses in the emergency bay are a bit slow making the bed ready because they are short-staffed and understandably they will then be busier" (SNP1)

On some occasions, due to the staff scheduling system of the hospital, there were less stroke nurses available, challenging the admission process:

“But when you are working your shift and instead of looking after 8, you are looking after 12 patients, then of course you get more stressed and the care given is not of such a high standard” (SNP2)

Secondary data illustrates that 854 (74.26%) out of the 1150 patients were not seen immediately by a stroke nurse in the ASU. From those 854 patients, 679 (79.51%) were admitted to the Hospital as FAST-, 131 (15.34%) FAST+ while 44 (5.15%) were admitted as TIA.

Similarly, although no instances were directly observed, secondary data confirmed that 1086 (94.43%) out of the 1150 patients were not assessed by a stroke or MAU doctor until more than 15 minutes after their time of arrival in the ASU (Figure 4.12 (B,C)). Amongst those, 880 (76.52%) patients were admitted as FAST-, while 148 (12.87%), and 58 (0.17%) were admitted as FAST+ and TIA respectively.

Unavailability of resources was also observed in the stroke beds. This also being an issue in previous stages. In 2 instances the process was paused due to an ASU bed for an incoming patient not being ready and, as a result, patients endured waits in the corridor of the ASU while stroke nurses prepared the bed (Figure 4.12 (D)). In 2 separate instances, patients were initially admitted to the ASU, but not to ‘D-bay’. This was due to unavailability of a bed in ‘D-bay’.

Variations in communication

Another frequently observed variation within stage 5 stemmed from communication routines of administrative information exchange between ASU practitioners, particularly delays of the SNP providing a handover for the stroke nurse (Figure 4.12. (E)). This was usually a secondary consequence of the variation mentioned above relating to unavailability of practitioners to assess patients earlier in the process. For example, when the SNP did not accompany a patient to the ASU, she was consequently unable to provide a handover to the stroke nurse. In those instances, the handover was delayed until the SNP returned from the ED.

Stage 5	Admission to ASU						
			Data source				
Variation observed	Activity	Actors involved	Observations (Patient number)	Secondary data	Nom/ interview quotes		Attributable factor
Unavailability of resources	Accompany patient	SNP	8 (1,2,24,29,45,47,51)			-	Staff scheduling & Shared resources
Actors not available	Patient monitoring	HCA/ Stroke nurse	28	854 (74.26%)		-	
						-	
	Medical assessment	Stroke doctor	-	1086 (94.43%)		-	
Beds not available	Patient admission	Patient	3 (27, 29,45)			-	
Communication issues	Handover	SNP- Stroke team	8 (1,2,24,28,29,45,47,51)			-	Unavailability & Shared resources

Table 4.10: Description of variations observed in patients' admission to ASU stage

4.6 Summary

The case study was covered in this chapter. Beginning with a breakdown of the care pathway stages, followed by a description of the main variations that were observed by the researcher, and which were also evident from secondary data analysis. Table 4.12 summarises the most frequently occurring variations in all 5 stages of the care pathway. These were unavailability of resources (i.e. actors, medical treatments and tests), primarily implying that there were issues around availability of resources shared between multiple hospital patient groups. Many communication variations relating to exchanges of clinical and administrative information required for the care process as well as communication for the co-operative decision making process between the various practitioners involved in delivery of the care pathway process were also noted. The final significant source of variations related to the system: failure of entering information into the IT system. These variations were mainly attributable to shared resource dependency – multiple professional groups share the same resources, staff competence on stroke care, the existing staff scheduling system, inefficient and ineffective existing artefacts for the practitioners to use and issues due to the patient themselves.

In the next chapter, these variations will be further explored and analysed.

	Pathway stages					
	Pre-arrival	ED admission	Brain Imaging	Medical assessment and treatment	Admission in ASU	
Unavailability of resources	<ul style="list-style-type: none"> • Communication issues • Scheduling system • Shared resources • Patient demand 	<ul style="list-style-type: none"> • Shared resources • Scheduling 	<ul style="list-style-type: none"> • Shared resources • Communication issues 	<ul style="list-style-type: none"> • Shared resources • Organisational targets and goals • Staff competence • Scheduling • Others (i.e. social care) 	<ul style="list-style-type: none"> • Scheduling • Shared resources 	Contributing factor
Communication issues	<ul style="list-style-type: none"> • Staff competence • Artefacts' inefficiency 	<ul style="list-style-type: none"> • Patient issues • Shared resources • Relational resources 	<ul style="list-style-type: none"> • Shared resources 	<ul style="list-style-type: none"> • Shared resources • Scheduling • Staff competence • Relational resources 	<ul style="list-style-type: none"> • Shared resources • Unavailability of resources 	
System failure	<ul style="list-style-type: none"> • Shared resources • Communication issues 	<ul style="list-style-type: none"> • Shared resources 	<ul style="list-style-type: none"> • Shared resources • Communication issues 	-	-	

Table 4.11: Summary of variations in the stroke care pathway and attributable factors

5 Discussion

In this chapter, the theoretical framing and empirical observations of this study are combined to help address the research questions. In line with a fundamental notion from the routines literature, the study confirmed that the abstract, ostensive aspect of the ‘in principle’ care pathway cannot be viewed as an all-inclusive and complete reflection of practice, but rather manifests as a referral framework upon which performances are based (Pentland and Rueter, 1994). Building on this expected gap between the ostensive and performative aspects of the pathway, the study found specific points of difference between the abstract stroke care pathway protocol and actual performances. Healthcare processes are dynamic and judgement based, and consequently, regular variations concerning the patient and the operating environment mean that clinical care processes are themselves subject to continuous change. The case description makes abundantly clear that the variations caused by, for instance, dependency upon shared resources, communication between participants separated by physical space, time and knowledge/medical specialty etc, rather than being structured and logical as presented, are typically chaotic and unpredictable. Further specific analysis of the activities within the pathway generated rich insights that can inform more robust theorising and pragmatic guidance. In this chapter, these observations are discussed with reference to the HOM and routines-informed theoretical framing by answering the two research questions, restated below:

1. *What, if any, are the distinctive characteristics of standard professional/judgement (healthcare) work?*

Distinctive characteristics of the pathway such as formalisation, fragmentation of the capacity and KPIs (Key Performance Indicators) induced misalignment of the pathway and overall hospital portfolio, undermining operational performance. Although a care pathway is a singular initiative, implementation takes place within an organisation already comprising a diverse portfolio of services, defined as the multitude of pathways and a large number of other clinical, operational and administrative activities.

2. *What are the challenges associated with implementation of standard work in a professional (healthcare) operations setting?*

Individual agency associated with professional services could easily create the gap between the ideal and actual pathway practices (Lewis and Brown, 2012). Knowledge specialisation

amongst healthcare professionals transforms autonomous inputs into operational processes, challenging their standardisation. Inconsistencies between practitioners' perceptions of how the process should be carried out, the subsequent creation of a hierarchical structure and the physical location of the practitioners were found to be key barriers to implementing a standardised process.

Some possible answers to each of the research questions are presented in the subsections below.

5.1 What, if any, are the distinctive characteristics of standard professional/judgement (healthcare) work?

The case data strongly suggests that the core operational challenge associated with implementing a single care pathway (and its specific bundle of actors, activities, interactions, etc.) is calibrating it in such a way that it does not conflict with the Hospital's overall care portfolio. National clinical care pathways are designed by external sources (e.g. Public bodies, governmental agencies etc), imposed upon healthcare organisations and performed by clinical practitioners. The interaction between these different actors (pathway modeller, the organisation and the practitioners) creates boundaries and dependencies that influence the decisions made about the use of evidence-based initiatives in terms of the apparent value, priority given, and significance of response (Bowen and Zwi, 2005). A multi-level analysis reveals additional insights in many areas (e.g. time and timing), but this study shows how distinctive characteristics of the pathway such as formalisation, fragmentation of the capacity and conflicting KPIs both support and oppose the transition between multiple levels (individuals, group, organisation) causing variations to the care process.

5.1.1 Formalisation of the pathway processes

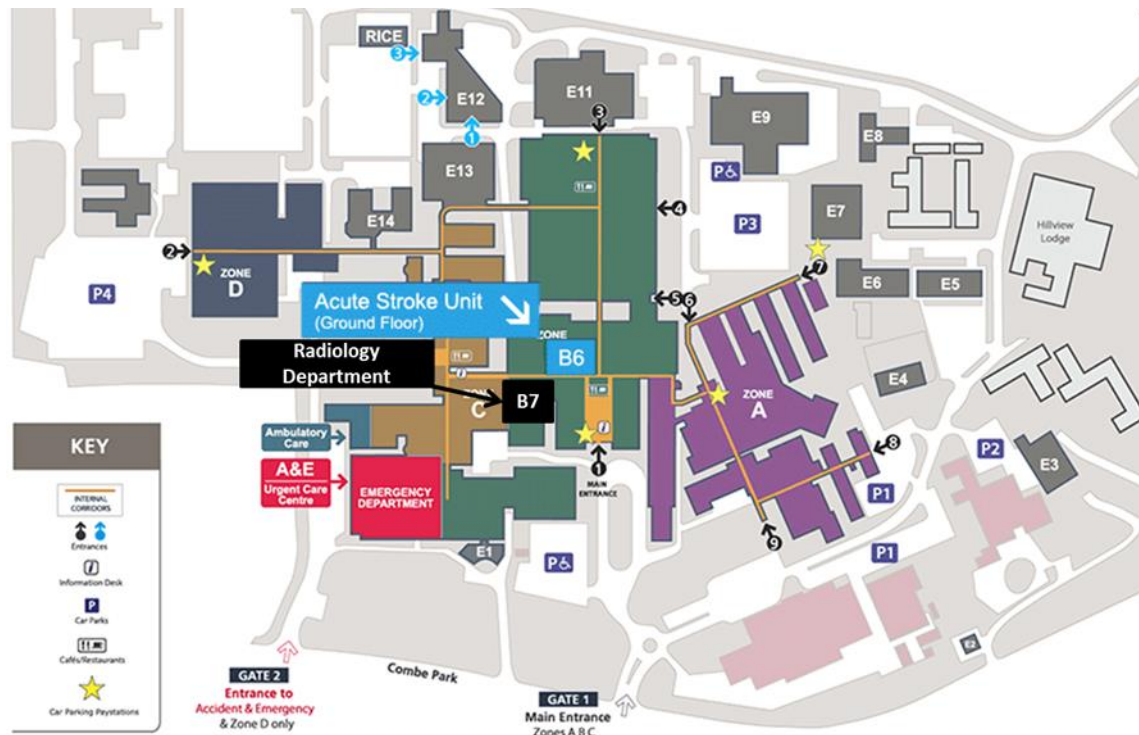
Supporting previous research, the findings of this study illustrates that formalisation of the care process had an important impact on its outcome. Formalisation of the care process is the extent to which the tasks of professionals and procedures that need to follow are standardised in the healthcare organisation. This serves as the vehicle which drives/guides the organisation in the right direction. The degree of formalisation differs broadly between different organisations and different levels within the same organisation (Robbins and Barnwell, 2006), but in general formalisation is an important and vital ?? to guide and control the individuals' action in a coherent way, eliminating process variation. Formalisation is

anticipated to assist in process standardisation and control to obtain predictable outcomes (Noon et al., 2013).

This study shows that formal design of the pathway and its component processes had an important impact on how practitioners interacted with each other resulting in variations to the process. The failure of the pathway designers (external sources) to consider both the specific characteristics of the organisational context within which the process would be implemented, and the individual agency and heterogeneity of the diverse practitioners responsible for delivering it, resulted in barriers to its effective adoption. Different forms of pathway formalisation and its interaction with the overall hospital portfolio, impacted its operational performance.

Geographical interaction

Geographical factors within the formal pathway design were found to undermine its effectiveness and efficiency. Firstly, the geography of the pathway undermined patient flow through its impact on working relationships between practitioners. Distance between practitioners restricted information exchange and, consequently, the sharing of knowledge between the practitioner groups. Picture 5.1 displays a map of the Hospital. The ED is located at a significant distance from the other two departments; the ASU and the RD. Exchange of both the administrative and medical information was essential for the coordination of care and was more efficient when individuals were located in close proximity. For instance, as already shown in the previous chapter, the ED coordinators always informed the ED senior doctor of the arrival of stroke patients at the Hospital, no matter how busy the ED was. Likewise, when the SNPs were present in the ED carrying out patient care, their communication with the ED coordinator were always more efficient.



Picture 5.1: Map of the Hospital

Conversely, when there was physical separation of practitioners; the quality of communication was negatively impacted. However, this was more pronounced between individuals located with considerable distances between them. Although, information systems were available, the continuously intensive, stressful and busy environment of the healthcare setting prevented them from using them effectively and harmed general communication between practitioners. For example, as illustrated before, the working environment of the practitioners located in different departments could be a contributable factor to the communication issues between them through the whole care process; during the patient pre-arrival stage, the patient admission (see Table 4.4, inter.: 26,27), brain imaging (see Table 4.5., inter.: 29), patient's assessment and decision making stage (see Table 4.5. inter.:58, 59,63).

Likewise, when the stroke doctor was not available on site; the context for the exchange was different. ED staff would only call when they felt that there was a real need for advice during out-of-office-hours of care, but more importantly transferring complex information regarding a patient's medical status over the phone was not always an easy and efficient task:

“Out-of-office-hours, we might have a stroke consultant on the telephone, but sometimes it is difficult to assess the patient from the telephone...” (SNP 2)

This finding supports past research on knowledge management, arguing that physicians are reluctant to exchange information when they are confronted with practical problems in the transmission of information (Radaelli, Lettieri and Masella, 2015). Tyre *et al.* (1997) presented the concept of ‘stickiness’ to show the high cost of sharing information between two actors due to the tacitness of the knowledge required to exploit such information (Radaelli, Lettieri and Masella, 2015). Because of this ‘stickiness’, transferring such information is costly and important information may get lost through the process of transferring the information.

Although the impact of social capital on pathway adoption and improvement will be discussed in following sub-sections, it is important to note here that when social capital between the practitioners was more developed, the process of exchanging information and sharing knowledge was more efficient. Professionals located in close proximity to each other, and had the opportunity to interact more frequently, developed better relationships which facilitated the information exchange between them. In the Hospital, when the SNPs needed to communicate with the stroke team, they called practitioners directly on their personal phone numbers, and thus communicated more quickly. In cases where the SNPs could not contact a colleague directly, they would contact an alternative member of the team whom they knew would be able to assist them. Miller *et al.* (2012) call this approach transactive memory. Transactive memory (‘know-who’) links tasks to required competencies that are embodied in identifiable individuals (Brandon and Hollingshead, 2004), thereby facilitating coordinated execution of tasks (Reagans, Argote and Brooks, 2005). The authors argue that when individuals interact over time, they shape their transactive memories, and develop shared understandings of where expertise to achieve particular tasks exists within an organisation eliminating routine variation (i.e. searching for who is able to do what, which causes delays etc). In contrast, in the event of requiring information from a colleague in a different practitioner group, the SNPs had to use the formal and highly impersonal Hospital communication system (the bleep); introducing delays. For example, if there was a delay in communications between the SNP and the Bed Manager, the SNP did not have an alternative contact in the Bed Managers’ team, forcing the SNP to wait for a response, creating stress and tension (see Table 4.5. inter.: 60).

Scholars of knowledge management note that the infrastructure of the organisation and in this case of the pathway, is part of an organisation’s structural capital and promotes or constrains information exchange among the professionals (Radaelli, Lettieri and Masella,

2015). While social capital does not provide a formal coordination mechanism, it serves as the underpinning for ‘high’ quality coordination (Gittel, 2002; 2011), allowing dependencies to be bridged more easily, and supporting coordination. Therefore, the geography of the pathway promoted or constrained information exchange, and subsequently, knowledge sharing as well as social capital among the professionals. These factors have been shown to be vital for effective collaboration and their absence induces variation of the processes.

Secondly, pathway design and embodied connections of the different practitioner groups created unnecessary patient movements, negatively impacting patient flow. Picture 5.1. shows the physical pathway process as it takes place within the Hospital. In this particular setting, the ambulance crew arrives at the front door of the ED (photo 1) and wheels the patient to RD (photo 2-19). The distance between the two departments is approximately 300 meters (4-5 minutes walking without any interruption) and staff pass through two common corridors (11-26). In those corridors other people walk, causing traffic (photo 7, 13, 14, 25, 26) and delay to the transfer of the patients. As patients were moved through corridors, there was frequently a high level of noise from other users of the corridor.

Recent research on quality of care, in critical care units and other healthcare areas has shown that hospital noise is negatively related both to patient outcomes from both the providers, and the patients’ own perspectives (Short *et al.*, 2011; Folscher *et al.*, 2015). Patients’ wellbeing and health outcomes have also been demonstrated to be impacted by higher levels of noise leading to poor sleep quality (Freedman, Kotzer and Schwab, 1999) and increased stress. From the healthcare providers perspective, noise pollution increases the probability of errors and is one of the risk factors for practitioner burnout (Tijunelis, Fitzsullivan and Henderson, 2005). Some studies indicate that noisy working environments are highly correlated to increased levels of staff exhaustion, burnout, depression, and irritability (Penny *et al.*, 2004). Consequently, although this was not evident in this study, the exposure of stroke pathway patients to a noisy environment may cause unnecessary stress to both patients and practitioners and could undermine pathway implementation.

In addition to mental health concerns, unnecessary patient movements (inside departments, wards and outpatient clinics) has been defined as one of the so-called ‘seven wastes’ that produce extra hospital costs: overproduction, inventory, extra processing steps, motion, defects, waiting and transportation (Hounshell, 1984). Unnecessary patient movements are indicative of poor hospital layout, with collaborative departments typically being located

with considerable distance between them (Chiarini, 2013). In this case, in order to practice the pathway, practitioners needed to turn 5 times, either left or right, (photo 2, 5, 7, 19, 23) complicating the pathway and subsequently, increasing the time of patient transfer. Following the CT scan, the ambulance crew return the patient to the ED, by the same route, and once assessment and diagnosis have been made, the ED staff transfer the patient to the ASU. Consequently, practitioners spent considerable time moving patients from one department to another. Such waste not only increased patient movement times, but undoubtedly contributed to levels of practitioner tiredness, since staff had to walk this route multiple times in one day increasing their workload and consequently, their levels of fatigue. This additionally created capacity issues, since practitioners who were engaged in moving patients between departments, were consequently unable to carry out clinical tasks.



Picture 5.2: Stroke care pathway process

Consequently, formalisation of the pathway and the associated impacts of geographical location on the interactions between practitioners had an important effect on the management of two formal process dependencies; shared resources and flow. Relational resources of professionals were found to be effective at eliminating and overcoming some of the coordination issues, supporting the communication of practitioners, but pathway design was not supportive of their development. In the context of healthcare where uncertainty, variation and complexity are unavoidable, relational resources function as a coordination mechanism by which practitioners can quickly manage process variation and thus eliminate medical errors. These relational resources enabled practitioners to exchange information more effectively, to share medical and administrative knowledge when needed (i.e. SNP contact stroke nurse to arrange a bed for the patient when bed manager does not respond to their [blob:https://web.whatsapp.com/1ee277b3-4c39-4159-8bf3-bcf0e9a8eab9](https://web.whatsapp.com/1ee277b3-4c39-4159-8bf3-bcf0e9a8eab9)call), and to span geographical boundaries.

Interaction with the artefacts

The formal design of the pathway embedded in process documents was an organisational (hospital managers) intervention to manage pathway dependencies and bridge both professional and geographical boundaries. However, in this study interaction of the pathway artefacts and the practitioner groups was one more manifestation of the battle between the pathway and the overall Hospital portfolio. Pathway artefacts, are physical manifestations of the organisational processes in documents or software by which managers try to promote pathway knowledge - constrain, coordinate, control and improve work practices (Becker, 2004). Physical artefacts have also been described as a mechanism that introduces variability or reinforces the organisational routines to ‘stay on track’ (Pentland, Hærem and Hillison, 2011). However, pathway designers might fail to capture the reality of the organisation within which these are implemented, creating considerable variation (Feldman and Pentland, 2003; D’Adderio, 2008, 2012; Pentland and Feldman, 2008) to the process. Supporting this notion, as already noted in the previous chapter, artefacts’ inefficiency in terms of content and availability introduced variations to the communication of practitioners such as stroke team and ED staff during the pre-arrival stage (see Table 4.5.: inter. 10,11) and between the RD staff during the brain imaging process. In the Hospital, there was no single, formal documental representation of the stroke care process. Instead there were 8 different versions of it (see: Appendix B) in different forms: 4 flow diagrams, 3 scripts and a combination of script and flow diagram. Each department involved had its own protocols employed to carry out the work. Unsurprisingly, this was viewed as problematic by clinical staff, creating variation in their performances:

“We have no clear protocol shared between us which complicates our work” (SNP2)

This observation was also supported by the discovery that none of the medical practitioners who was interviewed shared precisely the same understanding of the care process. Rather, all the individuals were providing information for the process based upon their particular professional roles, experiences and interests. While almost all interviewees could describe the macro abstract of the process, each of them could only provide details and clear explanations focussed upon their own part of the process. As OM (Douglas and Fredendall, 2004) and ORs (Feldman and Rafaeli, 2002; 2005; Pagell *et al.*, 2015) scholars claim individuals’ understandings of a routine differ according to their roles and perspectives,

resulting in processes that are not uniformly performed as designed, nor identically performed by all members of the organisation.

The level of information and detail involved in the artefacts contributed to the communication variations of the process. Within the Hospital, individuals from the different practitioner groups had diverse levels of proficiency with regard to stroke care. This diversity of knowledge on stroke care was illustrated in the design of the artefacts and created miscommunications among the practitioners. The absence of sufficiently detailed information, with regard to both medical and coordination issues, within the pathway documents hampered the practitioners' ability to efficiently and effectively carry out their tasks. The available artefacts failed to capture heterogeneity in professionals' characteristics (i.e. pathway knowledge and interests) creating conflicting performances. D'Adderio (2008, p. 786) emphasises that artefacts lead to the routinisation of the process if they successfully embed the intentions, assumptions, rationales, and logic of individuals in the written protocols of routines. This idea is consistent with the idea that general rules and procedures are partly specified when transferred across different contexts and always involve partial specification and absent components (Orlikowski, 2007; Becker and Zirpoli, 2008; Pentland, Hærem and Hillison, 2011). Consequently individual interpretation and judgements are required for filling in this missing information creating variations to the process (Winter and Nelson, 1982).

Figure 5.1 below represents two of the pathway documents, each produced by members of different practitioner groups involved in delivery of the care pathway. The first diagram (A) was developed by the stroke doctor and includes a greater percentage of clinical information, explaining to practitioners how to carry out elements of the care process. Stroke doctor assumes that the ED practitioners are aware of the coordination routines that they should follow, thus such information is not presented in the artefacts. While, the second diagram (B), developed by practitioners from the ED team, includes more information regarding the coordination aspects of the process, and assumes that practitioners are competent in respect of the knowledge needed to undertake clinical tasks. However, this was not what the researcher observed. In fact, the ED staff frequently did not know how to carry out particular clinical tasks (i.e. thrombolysis) (inter.:70), as well as coordination tasks (i.e. handover mechanisms) (inter.:33). This resulted in variations and practitioners spending more time seeking information from colleagues around them/or from the IT system in order to proceed with their tasks. Interruptions of this nature can lead to lower quality of care since they negatively impact on short-term memory of the actors involved, leading to clinical error

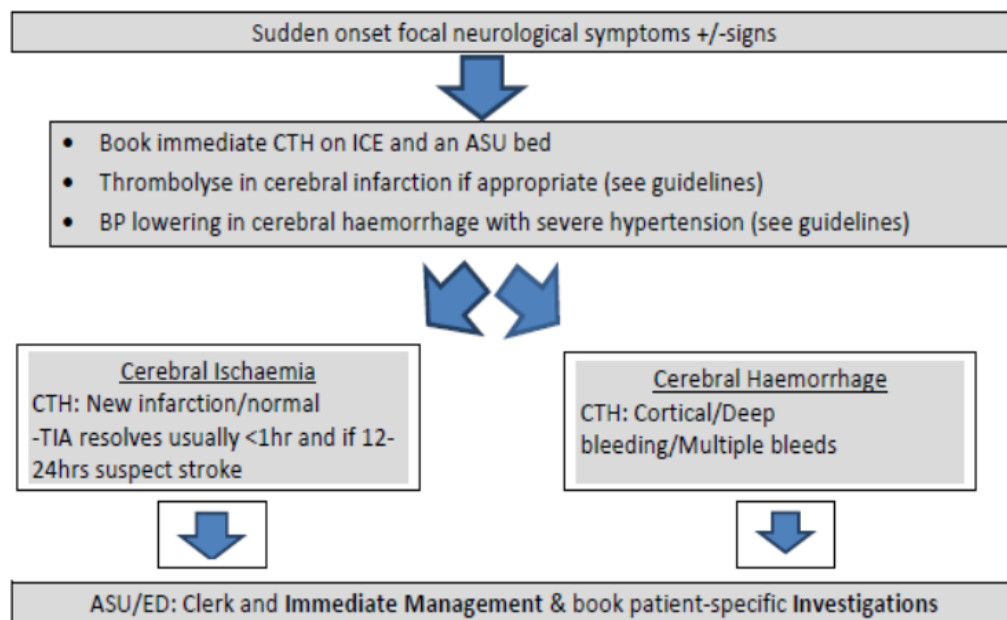
(Parker and Coiera, 2000; Coiera *et al.*, 2002). Hirsh and Watson (1996) argue that work interruptions diminish the ability of individuals to recognise a lack of sequence in their actions and the impact of their work on the work of colleagues. Thus interruptions introduce both variation to the sequence (i.e. different steps were followed) and to the eventual outcome of the process (i.e. delay).

Furthermore, none of the documents contained information regarding the working hours of key stroke practitioners (e.g. the SNPs, stroke doctors). Despite this assumption that practitioners were aware of colleagues' working times, 3 instances were observed where ED staff did not pre-alert the SNPs on the arrival of the patient because they believed that there was no SNP on site.

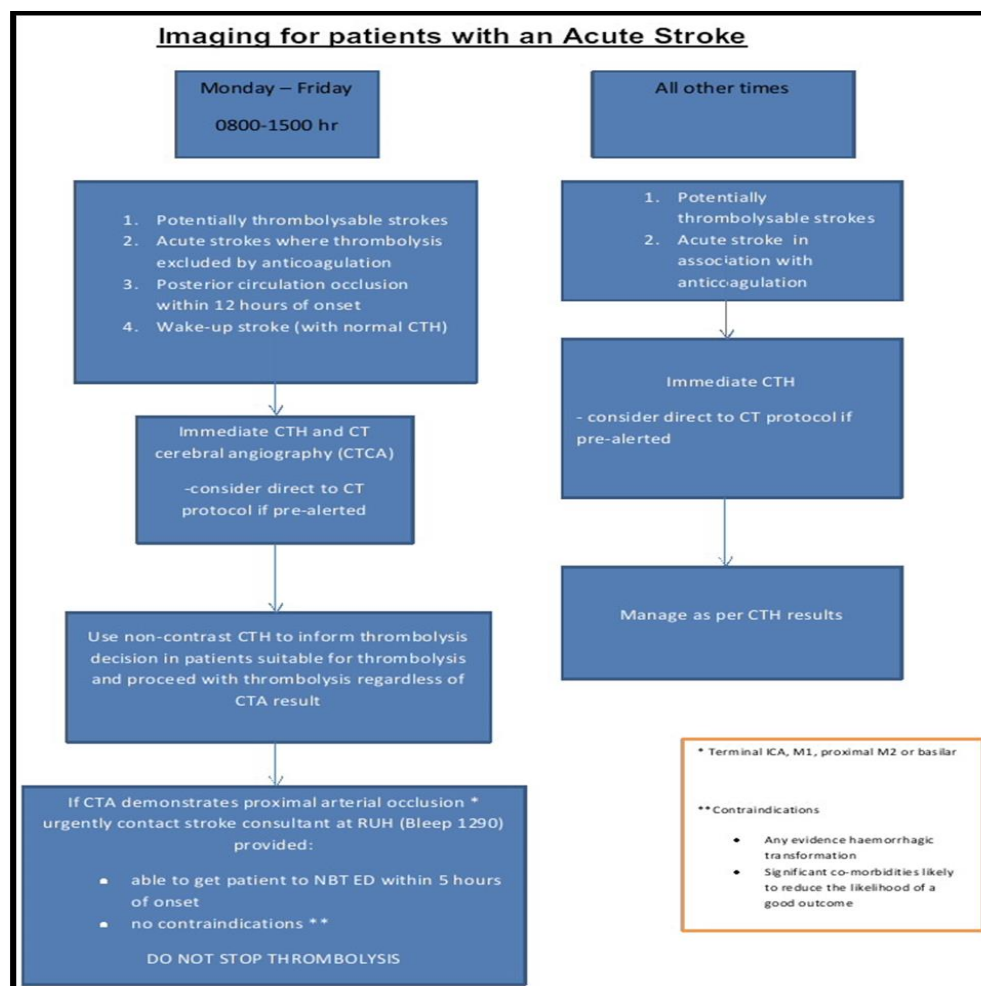
Observations of individuals lacking in coordination knowledge were typically made when the practitioners were relatively new to the Hospital. The negative impact of staff turnover on routinisation of an innovation has also been identified by routines *et al* scholars (Miller, Choi and Pentland, 2014). Variation in the set of actors involved in a routine surges the potential for errors, novelty, and improvisation (Miller, Pentland and Choi, 2012). Where individuals lack experience of practicing the process, routine networks are interrupted, consequently, preventing the standardisation of the innovation (Miller, Choi and Pentland, 2014). There were 2 such observed instances involving ED senior doctors, who were relatively new at the hospital and had limited experience of the stroke care pathway in operation at the Hospital at that time. Consequently, they failed to undertake important pathway tasks (i.e. admit the patient to the IT system immediately, alert the SNP), which created considerable variation to the process later. In particular, in 2 separate cases when the senior doctors concerned were in charge of a patient, they had to pause multiple times to ask the SNP, or other colleagues around them, how they should proceed. In a further 2 instances the ED doctor observed did not know the exact procedure of both requesting a CT scan and thrombolysing the patient - issues which resulted in pathway communications and timeliness variations. Thus, variation of the participants themselves influences what tasks get done, and how and when tasks get done. Since new staff are a source of novelty (Levitt and March, 1988; Dodd, 1991), differences in the actors involved in a process tends to increase the potential for its variation. This notion perhaps supports the intuitive insight that participants working frequently together, solving the same problem, can produce ongoing change in how a routine is carried out.

Scholars of knowledge management argue that individuals share and develop the organisational knowledge that is required for the effective performance of their tasks through interactions with sociomaterial (Pentland and Feldman, 2008; D’Adderio, 2011; Bresnen *et al.*, 2017; Mariano *et al.*, 2017). Artefacts comprise part of an organisation’s knowledge assets (Mura *et al.*, 2016), which represent the knowledge, skills and abilities that are available to the individual via codified procedures, databases and evidence bases (organisational capital) and via the tacit knowledge accessed through social interactions with co-workers, or clients (social capital) (Nahapiet and Ghoshal, 1998). Similarly, routines. Scholars note that the competence of individuals and consequently, the performance of routines, is mediated and essentially transformed by the capabilities of artefacts that they use in their work (D’Adderio, 2001, 2008; Latour, 2005).

In respect of the stroke care pathway, although formal pathway design embedded in artefactual forms was intended as a coordination mechanism to manage pathway dependencies, the failure of the designers to capture the practical reality of the organisation within which it was to be implemented, resulted in pathway coordination issues and misalignment of the pathway with the overall Hospital portfolio. Table 5.1. summarises how and the impact that formalisation of the pathway in two different forms: structure and artefacts have on its performances.



A: Stroke care pathway diagram produced by ASU in 2013, Reviewed and approved in 2016



B: Stroke care pathway diagram produced by ED doctor in 2015

Figure 5.1: Stroke care pathway diagrams

Forms of pathway formalisation	Insights	How?	Impact
Geographical interaction	Formal geography of the pathway and the associated distance between the practitioners impacts patient flow	<ul style="list-style-type: none"> • Unnecessary movements of the practitioners and the patients. • The efficiency and effectiveness of administrative information exchange is negatively impacted. • It eliminates physical interaction of professionals. Relational resources of practitioners supporting knowledge sharing and information exchange are constrained. 	<ul style="list-style-type: none"> • Increase of pathway timeliness, use of resources and practitioners' productivity. • Continuous variations in the quality of communication between the practitioners and availability of resources leading to breakdowns of the process. • Knowledge sharing behaviour of practitioners is constrained.
Interaction with the artefacts	Failure of the pathway designers to capture the practical reality of the organisation within which it was to be implemented resulted in pathway coordination issues and misalignment of the pathway with the overall Hospital portfolio.	<ul style="list-style-type: none"> • The availability and level of detail coordination and medical information involved in the artefacts undermined patient flow Individuals from the different practitioner groups have diverse on stroke care being illustrated in the design of the artefacts. 	<ul style="list-style-type: none"> • Communication issues between the practitioners • Interruptions to the process result in undermining both use of resources and accuracy of decision-making.

Table 5.1: Summary of pathway formalisation elements and their impact on its performance

5.1.2 Fragmentation of capacity (Shared resources)

The incompatibility of the formal pathway design with the characteristics of the organisation, resulting in conflicting performances, was also demonstrated in a range of concerns around capacity. Capacity in this research is defined as the availability (quantity) of physical and medical resources to support pathway adoption such as relevant actors and medical tests. The formal pathway design suggests a specific provision of resources (i.e. availability of the SNP, timely availability of CT scan and ASU bed etc.), but in practice Hospital resourcing, managed locally, created significant barriers to successful pathway adoption when multiple pathways were integrated within the Hospital. Hospital capacity was fragmented between multiple patient groups challenging pathway adoption. For example, as illustrated in The case study chapter, the availability of actors and medical tests (CT scan) the required time was delayed because these were shared between multiple hospital patient groups and there were not enough resources to support those (*see also Table 4.3.: inter. 5, Table 4.4.: inter.:17, 21,24, Table 4.5.: inter. 32, Table 4.6.: inter.33-35,50,51,54*)

To maintain a match between demand and capacity requires collaboration within and between Hospital departments to keep operational processes organised and manage the flow of patients. Although collaborative inter/intra-departmental balance between demand and capacity is a complex challenge, it is of supreme importance to efficiency and flow across healthcare organisations.

The emphasis on resource utilisation and performance requirements within the departments delivering care processes created a conflict of interest between the department which supplied the particular resource and the demanding departments' (customer) need for the use of the resource (Drupsteen, van der Vaart and Van Donk, 2016). Durbsteen *et al.* (2016) found that different hospital departments involved in the integrating process were concerned with their own performances but ignored how well, or how badly, the other practitioner groups or the whole hospital performed. The supplying department responsible for a shared resource was held primarily responsible for resource management. The requesting department desired rapid admission, a potential conflict with the objective of the supplying department. Therefore, shared resources, prevented collaborative behaviour between practitioners in different departments and subsequently impacted the capacity and performance of all the departments. The authors term mode of delivery a 'compartmentalised' approach to performance management arguing that it hinders care

integration. They further explain that compartmentalised performance management is entrenched in a healthcare culture that is patient-centred, rather than process-focussed, as each department is focussed upon its particular phase of the patient's care process, thus impeding inter-professional collaboration (Drupsteen, van der Vaart and Van Donk, 2016). The compartmentalised approach to performance management can also be explained and supported with the literature on functional silos approach. Functional silos drive to fragmented care (Mann, 2005). Individual functional groups incline to act as a stand-alone function, frequently framing their own strategies and working plans in parallel with the organisation. However, the pressure to improve performance consequences in sub-optimisation (in single silos) that may not result in overall improvement of care provided to patients (de Souza and Pidd, 2011) (Kim et al., 2006). Simply, functional silos aim and focus on maximising their own performances and goals, which are not usually the objective of the organisation. In the context of this study the ASU team was dependent upon input from the ED and the RD to deliver the stroke care pathway, and consequently was left fighting for the required resources against the prioritisation of multiple other patient groups:

Furthermore, resources specifically dedicated to stroke care (i.e. stroke nurses and beds) were also frequently used to support the function of other hospital departments. Although practitioners and Hospital managers might be aware of the impact that these actions had on the stroke care process, their main interest was to address any issue or shortage of resources in the other departments in order to facilitate the patient flow of the hospital. This could be assumed as a behavioural aspect in the bed allocation of practitioners. Practitioners tend to utilise stroke beds in order to avoid breaching protocol in the overall organisational processes of the hospital.

Such behaviour of the practitioners was a consequence of stroke care's designation within the hospital as a 'general medicine'. This meant that stroke nurses were considered capable of providing care to any general medical patient while on numerous occasions the Bed Manager allocated stroke beds to non-stroke patients because they had to be transferred out of the ED, in order to facilitate patient flow. In any case, as already shown, this unavoidably led to shortages of stroke beds (see Table 4.5.: inter.49) and nurses and consequently in process timeliness issues. Picture 5.3. shows the staffing level of stroke nurses at the Hospital on one day that the researcher was present. Because another ward was short of staff, the Hospital staff manager moved one registered nurse from the ASU for the early and night shifts (assuming that the number of stroke patients arriving at the unit would be fewer during

those times). However, this was not always the case and in many instances, the remaining stroke nurses were overloaded with work.

Staffing		Acute Stroke Unit	
Date: [Redacted]		Nurse in charge of Shift: [Redacted]	
EARLY SHIFT		Planned Numbers	Actual Numbers
Staff			
Registered Nurses	5	4	
Health Care Assistants	5	5	
LATE SHIFT		Planned Numbers	Actual Numbers
Staff			
Registered Nurses	4	4	
Health Care Assistants	4	4	
NIGHT SHIFT		Planned Numbers	Actual Numbers
Staff			
Registered Nurses	3	2	
Health Care Assistants	3	3	
Senior Sister/Charge Nurse of Department		[Redacted]	
Name of Matron		[Redacted]	

Picture 5.3: Staffing level of stroke nurses

This situation introduced a political dimension to resourcing. Organisational theorists who have closely examined resource allocation amongst several inter-dependent departments within organisations argue that control of resources is associated with personal and organisational power (Pfeffer and Salancik, 1974). Organisational theorists argue that the clinical departments that have greater control over the allocation of their resources, and which share these among multiple professional groups, are in a more powerful position than the departments that are dependent upon them (Pfeffer and Salancik, 1974). Hospital departments and individual practitioners in charge of critical resources shared amongst multiple wards and practitioners, had to make sure that the hospital kept functioning even at the cost of particular care pathways not being well supported. Consequently, with control of necessary resources residing outside of the ASU, pathway adoption was negatively impacted.

Another contributory factor with regard to this discrepancy between patient demand and resources as already mentioned in the previous chapter, stemmed from the Hospital staff scheduling system. This is a typical source of artificial variation in the supply of healthcare services (Noon *et al.*, 2003; Silvester *et al.*, 2004; Radnor *et al.*, 2006), also illustrated in this case. Table 5.1. displays the scheduling of staff involved in the pathway, both during in-hours and out-of-hours of care.

Hospital Departments	ED	ED	RD	RD	ASU	ASU
Days of the week /Hour of the day	Weekdays	Weekends	Weekdays	Weekends	Weekdays	Weekends
8-8:30am	3 SDrs	2 SDs	3 Rs & 1 SR OPEN	1 SR & 1 R OPEN	1 SD	1 SNP & 1 SDr
9am-12:30pm				1SR & 1 R CLOSE	1 SNP out-reach & 1 on the ward & 1SDr	
1-1:30pm						
2-2:30pm	1 SDr	1 SDs & 2 Drs	1 SR on-call & 1 R CLOSE			1 SNP on out-reach& 1SDr on-call
3-5pm	3 SDrs & 2 Drs					
17:30:00						
6-8pm	1 SDr & 1 Dr	1 SDr & 1 Dr	CLOSE - 1 SR & 1 R on call	CLOSE 1 R & outsourcing company	No SNP only 1 stroke doctor on call	
8-9pm						
9-10pm						
10-11:30pm	2 Drs on-site & 1 SDr on-call	2 Drs on-site & 1 SDr on-call	CLOSE - 1 SR & agency company			
12-7:30am						1 Dr on-site & 1 SDr on-call
ED=Emergency Department, RD=Radiology Department, ASU=Acute Stroke Unit, SDr=Senior Doctor, Dr=Doctor, SR=Senior Radiologist, R=Radiographer, SNP=Stroke Nurse Practitioners						

Table 5.2: Pathway staff scheduling in the Hospital

During out-of-hours care there were less senior decision makers in the Hospital, impacting both the effectiveness and efficiency of the pathway. As already shown in the previous chapter, the available practitioners were physically unable to provide sufficient care to all patients resulting in flow issues both for the Hospital portfolio and the stroke care pathway. Such issues could be unavailability of beds due to delays in patients' discharge (see Table 4.5.: inter.54), inefficient communication between the practitioners both for the exchange of administrative information and decision-making process (see Table 4.5.: inter.62).

Insufficient numbers of specialist stroke care practitioners influenced not only the time but the accuracy of the pathway decision-making process. Non-specialist staff misdiagnosed patients leading to negative impacts on patients, the Hospital portfolio and the stroke pathway flow.

These findings were also supported by analysis of the secondary data, which showed that 43(3.7%) patients were initially diagnosed with stroke but were subsequently given a different diagnosis, while 12(1.04%) patients were initially diagnosed with different morbidities, but subsequently received a second or third diagnosis of stroke. All these patients received a consultation from a non-stroke specialist ED doctor and were not immediately assessed by a SNP. It was further interesting to note, that 30(70%) of those patients experienced a delay before being assessed by the doctor. The specialty and experience of the physician at the point of the first contact has also been shown by other scholars to be an influential factor on improved management of stroke care, and thus key to (Saposnik *et al.*, 2007; Ogbu *et al.*, 2011) eradicating variations to the process (Saposnik *et al.*, 2007).

It was notable that the pathway design did not consider the ASU staff scheduling inhibiting the effectiveness of the pathway. Table 5.2 shows the staff scheduling of stroke doctors for three consecutive weeks during the time of study. (The names of doctors have been changed for purposes of data confidentiality). The highlighted cells show that the same doctor (i.e. Olga) could be on-call (in charge of the arrival of the ED patients), and in charge of two or more bays during a single shift. Consequently, stroke doctors had to deal with the care of multiple patients and on multiple occasions they were unable to respond to the calls of the SNPs or ED staff in order to provide advice, at the same time due to the increases in their workloads. The impact of lack of resources on practitioners' workloads has been documented in an extensive body of healthcare research looking at the effects of resourcing on team performance (Reid *et al.*, 1999; Gerein, Green and Pearson, 2006). During these weeks stroke doctors were either delayed in examining patients, or preferred to give their advice over the phone introducing timeliness and accuracy issues into the diagnosis process (see Table 4.5: inter.58,59).

Weekdays	Monday	Tuesday	We/day	Thursday	Friday	Saturday	Sunday
Shifts	Week 1						
Ward A & B	Adam	Costas	Olga	Adam	Adam	Elena	Elena
Ward C & D	Costas	Olga	Olga	Costas	Olga		
TIA Clinic	Helen/ Adam	Matt/ Costas	Elena	Thomas/Co stas	Jory/ Olga		
On Call in Hours	Adam	Olga	Olga	Costas	Olga		
On Call off- Hours	Adam	Olga	Costas	Costas	Elena		
	Week 2						
Ward A & B	Costas	Mary	Mary	David	Marta	Marta	Marta
Ward C & D	Mary	Olga	Olga	Mary	Mary		
TIA Clinic	Harry/ Costas	Harriet/ Olga	David	Tom/ Mary	Lucy /Mary		
On Call in Hours	Costas	Olga	David	Mary	Mary		
On Call off- Hours	Costas	Olga	David	Mary	Marta		
	Week 3						
Ward A & B	Costas	Costas	Mary	Costas	Costas	Costas	Costas
Ward C & D	Mary	Costas	Mary	Mary	Mary		
TIA Clinic	Harry/ Costas	Harriet/ Costas	Thomas/ Mary	Richard/ Mary	Lucy/ Mary/ Costas		
On Call in Hours	Costas	Costas	Mary	Mary	Costas		
Ward A & B	Costas			Mary	Costas		

Table 5.3: Stroke doctor scheduling on 3 consecutive weeks

Inevitably, the impact of resources/capacity became even more acute when there was an increase in overall patient volume (see Table 4.5. inter.49-52). One challenge that practitioners encountered when trying to link pathway activities with implementation/standardisation was the inability to control Hospital and ward capacity levels in order to sustain pathway implementation. Diminishing unwanted uncertainty and variation is a serious challenge in healthcare processes. Variation in the number (volume) of patients arriving at the hospital over time is quite substantial and sometimes difficult to grasp (Lifvergren *et al.*, 2010). However, stroke patient needs and conditions vary greatly across the component parts of the stroke care process, and thus it is important that patient demand is matched with capacity as precisely as possible to maximise value (Al-Balushi *et al.*, 2014).

In the Hospital, there was 1 stroke nurse and 1 HCA available to support emergency patients in the ASU and when patient demand increased, they found it difficult to manage care. This created a considerable impact, both on the quality of care that patients received and their time of assessment, causing fragmentation of resources.

Similarly, there was 1 (if any) SNP available (Table 5.3.) to facilitate the pathway every day. There were only 3 SNPs in total and it was not uncommon that 1 of them was sick or had other commitments and could not perform their duties. Consequently, when patient demand increased, the SNPs struggled to perform the pathway, being unavailable to offer the same service to all of the patients (see Table 4.4: inter.3, Table 4.5.: inter.24, Table 4.5: inter.36). Figure 5.2 shows the trend of stroke patient arrivals at the Hospital each day. As expected, incidences are not consistent. On most days patient numbers ranged between 2 and 3, but on some days more than 5 patients were admitted to the Hospital. This made the work of the SNPs more challenging, especially if more than one patient was admitted within a short space of time.

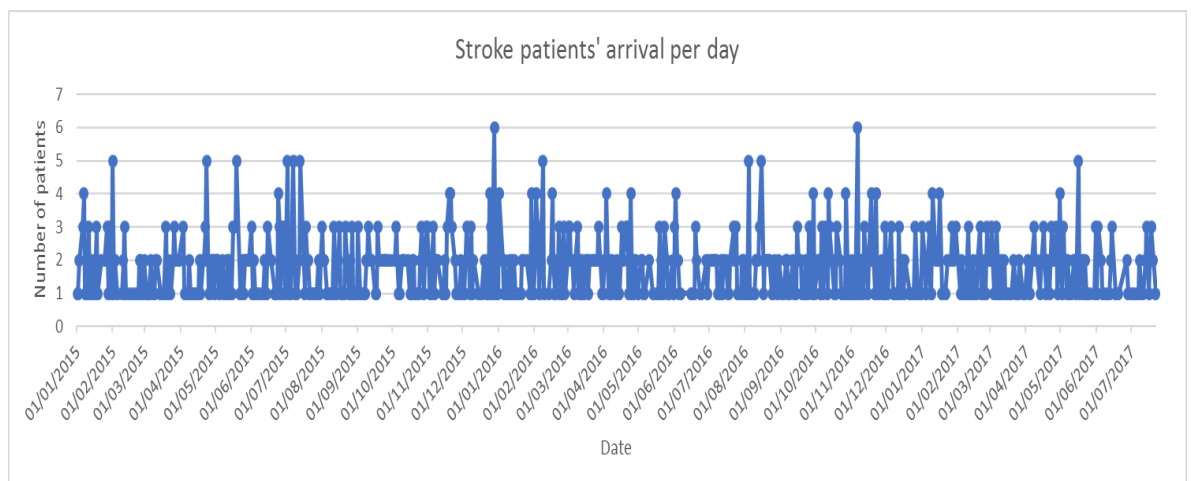


Figure 5.2: Trend of stroke patient arrivals per-day

Figure 5.3. is taken from the annual evaluation report produced by the SNPs. In the text **bolded** the SNPs noted that out of the 17 stroke patients that arrived at the Hospital during that time period, 10 were admitted to the ASU within 4 hours of arrival at the Hospital, and 3 were delayed more than 4.30 hours. The SNPs explained that 4 of the 7 patients experienced delayed admission due to unavailability of an SNP on site to facilitate their pathway while in the other 2 cases, although SNPs were on-site, they were caring for other patients admitted at the same time.

[...] 17 patient admission cases were examined.

Admit to ASU from clock start (Admit to ED)			
hours	< 4.30 hours	hours	> 12 hours
10	3	3	1
(58.8%)	(17.6%)	(17.6%)	(5.8%)
MNP 9		MNP O	MNP O

The admit time within 4 hours is slightly above the current estimated SSNAP prediction for our quarter 1 Apr-Jun 2015 of 55.5%.

The MNP was on duty for 13 cases. 2 breached the < admit to ASU within 4 hours. One by 5 minutes, and another by 25 minutes, **two cases did not have a clock start (repatriation and clinic direct admit). Looking at workloads on those dates of breaches, the MNPs were working with multiple admissions. Service demand may account for this.**

Figure 5.3: Evidence taken from annual SNP evaluation report

The findings of this research have also shown that variability and uncertainty in patient volume associated with existing capacity issues also had an impact on collaboration between individuals while carrying out the care pathway. These findings are consistent with the work of other OM scholars who have shown that uncertainty and variability in patient demand inhibits inter-departmental integration (Drupsteen, van der Vaart and Van Donk, 2016).

Similarly, within the Hospital, due to the subsequent increase of practitioners' workloads, their ability to collaborate was challenged. In particular, as already discussed above when practitioners were busy, the exchange of administrative and medical information – important for the facilitation of the pathway – varied, creating process communication coordination issues (see Table 4.3.: inter.26, Table 4.4: inter.26,27, Table 4.5.: inter.30, Table 4.6: inter.58,59,61) as well as practitioners being unavailable to carry out their tasks (see Table 4.3.: inter. 6,4, Table 4.4.15-20, Table 4.5.: inter.32, Table 4.6.: inter.33-47). Likewise, Radaelli *et al.* (2015) noted that increases in practitioners' workload affect the amount of time and degree of resources that staff can devote to exchanging information and sharing knowledge, negatively impacting initiative adoption.

However, as illustrated in The case study chapter, in the Hospital, when practitioners were unable to carry out their tasks, the staff blurring issue was observed. This implies that in order to mitigate the variation and proceed with the pathway, some tasks were underaken by other available and eligible staff involved in the pathway, resulting in issues with their workload (see Table 4.6.:inter.39-45). Consequently, those staff were unavailable to proceed with the care of other incoming patients, impacting both the stroke and Hospital portfolio proceses.

Additionally, practitioners tried to find other ways to accommodate such variations, interrupting their work. Therefore, although a single pathway may be coherent, when it is implemented within a hospital with multiple other incompatible pathways and treatments, it can become incoherent. Every additional step that practitioners had to take, no matter how small it seemed, added to the complexity of completing their tasks (Tucker, 2004) and consequently, their overall workload - preventing them from concentrating on their tasks. Research that examines the workload of healthcare practitioners has shown that interruptions in the work of the practitioners contributes to its increase (Myny *et al.*, 2012; Hopkinson and Jennings, 2013).

Over time practitioner workloads, frustration, exhaustion and burn out began to take its toll in the system which had a direct effect on both the staff and the pathway:

“We cannot really sustain seven days’ service between the three of us. Sometimes there are fewer of us - only one. Because you know people do burn out. And there is sickness and there is holiday cover and all that” (SNP1)

Some of the staff noted that due to these difficult working conditions, and the subsequent tiredness and exhaustion, in the long term, Hospital capacity issues result:

“So there is a national shortage of stroke specialist nurses. And there is no incentive for the nurses to want to work anyway because they know they will be exhausted within this profession” (SNP 2)

The impact of fragmentation of care on collaboration between practitioners was also noted in the practitioners’ concerns about the funding system. The need to share resources resulted in a funding system perceived as ‘unfair’, which exacerbated conflict amongst individuals and the inter-departmental conflicts over resource allocation, subsequently leading to lack of motivation for the adoption of the pathway:

“RD pays for the issues of other departments. On our own as a business unit we could make the most amazing service unit. For instance, at the moment, we need extra MRI scanners which we could have bought ourselves years ago, but instead, funding of the car park is now being paid for by the department’s surplus budget. I am confident that we could do this, but the organisation cannot meet their own expenses and are under extra pressure because they cannot meet their own targets. It is difficult to raise in discussions because they cannot plan” (radiologist 2)

Tucker *et al.* (2007) studied operational failures and tested a frontline system improvement in US hospital nursing units. They found that creating an egalitarian environment can contribute positively to collaboration and consequently, healthcare outcomes. Similarly, some research on team performance argues that individuals who feel that they are treated equally and fairly are more motivated to collaborate and contribute to the work of the team (Gitlin, Lyons and Kolodner, 1994).

Hence, although a pathway is introduced to improve both the effectiveness and efficiency of the Hospital, of equally great importance is consideration of how its introduction will impact the existing portfolio and the available resources shared within it. Without due consideration, its alignment with the Hospital portfolio is challenged. Particularly, this results in:

1. Current (i.e. bed shortages, staff being unavailable to carry out their tasks etc.) and future unavailability (i.e. staff burned down) pathway capacity issues.
2. Collaboration issues among the practitioners, such as inefficient (i.e. delay) and ineffective (i.e. inaccurate) communication issues among the practitioners.

5.1.3 Conflicting Key Performance Indicators (KPIs)

To control individual actions and match pathway capacity with demand, the organisation itself, and pathway modellers, set a number of pathway key performance indicators. Misalignment of the pathway targets with the other pre-existing portfolio targets and goals, induces ‘quasi-competition’ of the pathway with other hospital treatments and pathways for the necessary resources. Centrally, distinct targets shifted the emphasis from local delivery of care to adherence to national standards resulting in the delivery of lower quality of care (Grove *et al.*, 2010).

The findings of this study support the theory of routines scholars that an initiative is more likely to be implemented if it is designed and supported by political dynamics and the

prevailing socio-political climate (Greenhalgh, 2008) and incentives. Greenhalgh (2008) further notes that if the introduction of new practices comes with rules and targets that align with existing routines and targets of the organisation, then this will most probably be accepted and implemented within the organisation (Greenhalgh, 2008; van Raak *et al.*, 2008). Conversely, if new rules and targets conflict with pre-existing routines and organisational targets, this challenges inter-professional collaboration and subsequently, initiative adoption (Greenhalgh, 2008; van Raak *et al.*, 2008). Although the common goal of the stroke care pathway was to provide good quality of care, in order to meet that goal, individuals had smaller practical system targets, (e.g. CT scan within 1-hour etc) - based on national standards, which mainly guided their work. However, these were not aligned with the specific pathway, challenging its implementation:

“We have so many KPIs and these are conflicting” (SR1)

“It is all about statistical things. We have so many KPIs that we are trying to manage to. We have two weeks target cancer, we have 6 weeks target cancer, we have 18 weeks cancer target, our patient pathway target and all these are conflicting...” (SR1)

As Feldman *et al.* (2000) explains; targets (in this case from a national institutional perspective) “limit employees’ choice of action” and require them to practice care in a particular way. In the Hospital, this was perceived by the actors to have unintended negative consequences at both the portfolio and the individual stroke care pathway. The Hospital attempted to achieve numerous impractical targets, which caused perverse behaviours, driving practitioners to concentrate their efforts on achieving specific statistical targets rather than patient satisfaction associated with high quality of care:

“If stroke care key performance indicators/targets were the ones that the hospital was more concerned about meeting (based on government guidelines), then ED staff would be more interested in becoming stroke care specialists” (SM1)

The existing institutional rules such as initial patient assessment within 15 minutes, patient assessment at the front door within 5 minutes, as well as the existing externally set rules as the 4 hours ED target and CT scan of every ED patient within 1 hour from the time of admission, contributed to the development of practitioners’ priorities and objectives and subsequently, their degree of motivation to prioritise stroke care. Since the practitioners have high levels of autonomy, misalignment of their objectives and professional interests caused the development of an informal patient prioritisation system. As already noted before,

unavailability of stroke resources was a result of practitioners prioritising the care of other than stroke patients (Inter:....). This patient prioritisation system was designed by the practitioners based on their informal decisions. The competition between the stroke care pathway and other pathways and patient groups further undermined its adoption in this respect since non-stroke specialist staff typically prioritised the care of other patient groups (an issue that was a driver for creating the national pathway in the first place) and the meeting of ‘more important’ targets:

“The other thing that actually affects stroke care is when other conditions are being prioritised. Before the stroke guidelines came in, stroke care was of high value, but then sepsis became important, the theme that the hospital is working on. So, everyone focuses on sepsis. And there are times that you have both a stroke and sepsis patient admitted and you are persuading one nurse to do both. They will go with the sepsis because that is what they are familiar with, they are getting emails about. If they are doing right or if they are doing wrong. And it can be difficult to encourage people to change their priority. So, when a new theme comes in, all of a sudden the focus changes. And I think that change speeds the way we do things for the care of the particular patient group” (ED2)

Figure 5.4 Illustrates (dot line) what happens when sepsis, trauma, myocardial infarction, or kidney patients were admitted to the Hospital at the same time as a stroke patient. These are four other time critical pathways in operation at the Hospital, at the time that this research was conducted. When a patient from one of these four pathways arrived at the hospital at the same time as a stroke patient, the ED doctor prioritised their care and was unavailable to assess the stroke patient at the front door thus, the SNP had to assess the patient alone. The brain imaging process could also be impacted since timely provision of a CT scan was also critical for patients on the competing pathways

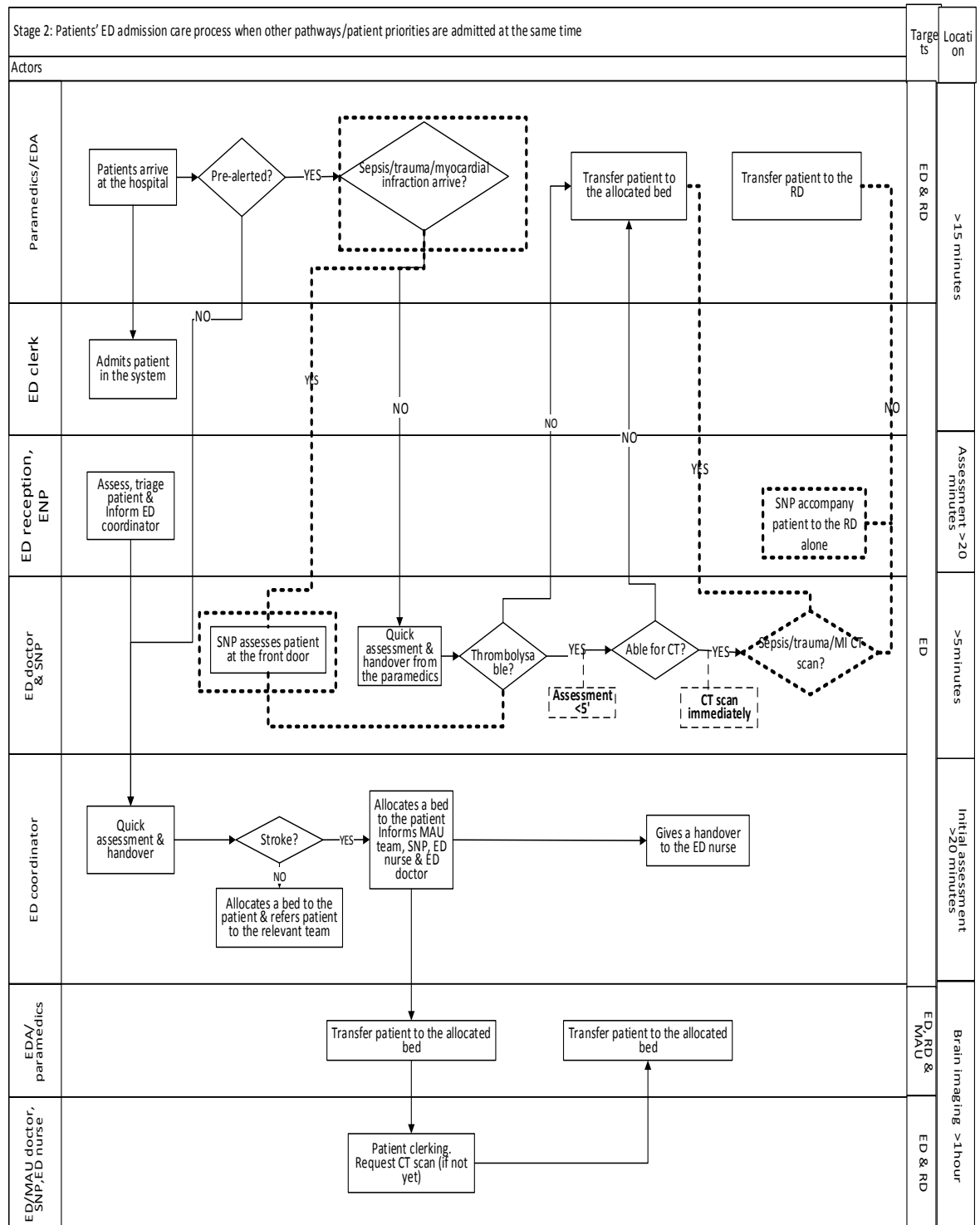


Figure 5.4: Illustration of pathway performance when non-stroke patient is prioritised

Informal patient prioritisation was also observed within the stroke pathway patient population. Stroke patients were in effect “competing” for the necessary Hospital resources. Although medical guidelines specify urgent specialised care and treatment for stroke patients, the primary focus of attention was on patients diagnosed as FAST+ for whom care was associated with more institutional targets:

“I think another issue of the process is that the system may work quite fast only for the FAST+...The ones who are thrombolysable, I think it seems to get them through very fast” (SD 3)

The focus of best possible care on FAST+ (pre-alerted) patients suggests that that practitioners may hold back on immediate best care of FAST- patients putting their health at risk:

“As soon as the things do not need to be done as FAST+ they don’t seem to be done as well. It is what I would reflect on, I think “(ED 1)

This observation further underlines the fact that institutional and governmental targets influence the care decisions of medical staff for the practice of care, sometimes undermining quality of care. Although stroke patients were not always pre-alerted as FAST+, an early medical assessment to exclude the probability of the need of treatment is essential to patient outcomes. Targets were driving stroke care in undesirable ways, even within the work of stroke care specialist practitioners.

Another observed indicator of the influence that conflicting targets (administered from governmental/institutional standards) and subsequent interests of each professional group had on pathway implementation was the pathway performance (mis)measurement system. Having a suitable performance system, and a robust measurement and incentive system to monitor progress is essential for every OM initiative (Grove *et al.*, 2010; Al-Balushi *et al.*, 2014). This is especially the case within healthcare settings, in which the strong medical professional identity has been repeatedly documented within OM (Tucker, 2004; Grove *et al.*, 2010; Lifvergren *et al.*, 2010) and ORs (Essén, 2008; Dittrich, Guérard and Seidl, 2016) scholars as an ascendant driver of professionals’ motivation to adopt managerial initiatives (Lewis and Brown, 2012). In this case performance strategy failed to capture the existing heterogeneity of professional groups’ interests and objectives. Individuals focused on meeting their departmental targets and practiced different pathway evaluations. This resulted in faulty evaluation of the pathway and subsequently inhibited pathway improvement:

“ED staff report patient data in a different way to us. Often there are differences between the times of admissions in ED and ASU that we (stroke team) write and the ED staff do. I think this happens because they are not as interested in the time targets as we are. Or maybe they do not know, thus they are not very careful about promptly reporting the

times that the admissions or treatments took place. Thus, when they remembered to do it they were not accurate” (SNP2)

This finding was verified by analysis of the secondary patient data. Out of the number of patients constituting the data set (1358), 139 (10%) of those had discrepancies in the coding provided by the ED staff and the ASU (e.g. time of patients’ admission, time of treatment or discharge etc).

Furthermore, pathway KPIs and the subsequent feedback mechanisms failed to reflect these discrepancies and consequently, practitioners perceived them to be lacking in credibility:

“Some people are less convinced than others. It comes from evidence based. That is quite interesting. In this hospital, we have much less stroke thrombolysis....it is controversial and evidence-based influences their decision to thrombolyse or not” (EDD2)

Within the Hospital, pathway KPIs were primarily driven by process-compliance (i.e. waiting time, length of stay (LOS), treatment and diagnostic times etc), and were found to be insufficient for developing practitioners’ confidence in the pathway, and the skills required to develop it. Therefore, failing to capture the heterogeneity of national/institutional and subsequently practitioners’ targets and interests in the design of the pathway performance system inhibited its adoption. These findings, lend support to the theories of several OM and management scholars; that KPIs should; be derived from strategy (Kaplan and Norton, 1992); represent the different dimensions of an organization (Kaplan and Norton, 1992), and consider the organisation as a unit comprised from multiple stakeholders with various interests, and objectives (Neely, Adams and Kennerley, 2002).

Thus, although governmental and institutional bodies set stroke pathway management and clinical targets based on national evidence regarding optimal care, they do so without cognisance of how these need to be adjusted in order to integrate with existing Hospital portfolios (Klein and Sorra, 1996; Grove *et al.*, 2010; Löfgren *et al.*, 2012), so that pathways are aligned and are not negatively impacted by the initiative. Practitioners consequently dispute the validity of these KPIs, undermining pathway implementation. As noted above the pathway design represents only flow dependency and fails to consider management of fit dependency necessary for stimulating operational performance.

5.1.4 Summary

This first sub-section of the discussion chapter contains an illustration of the distinctive characteristics of standard professional judgment work. A multilevel analysis of the pathway adoption at different levels (macro and micro), yielded important insights into the distinctive characteristics of the stroke care pathway that account for the misalignment of the pathway with, and within, the Hospital. Pathway designers failed to capture characteristics of the organisation and the individuals that carry out the work, resulting in conflicting routine performances. The geographical location of practitioners within the pathway influenced the connections between practitioners and departments, impacting the way that they work together. This resulted in patient flow issues (i.e. timeliness of transferring the patient), and exposed patients and practitioners to negative environmental factors. The geographically dispersed nature of practitioners delivering component parts of the pathway negatively influenced their ability to exchange the administrative and clinical information necessary for effective pathway delivery, thus compromising coordination of their work. The ability of practitioners to develop social capital was also restricted, and this also undermined effective process coordination.

The nature of interactions between the pathway artefacts and the practitioner groups was a further indicator of the conflict between the pathway and the wider Hospital portfolio. These artefacts failed to capture the heterogeneity of professionals' competence and professional interest levels in relation to stroke care, restricting knowledge sharing between practitioners, and creating further coordination issues.

An additional illustration of the competition between the pathway and the Hospital portfolio due to pathway design was observed in concerns about capacity, and the presence of a political, as well as professional, dimension to resourcing. Clinical departments involved in the process provided care to multiple patient groups, and due to the criticality of their resources for overall Hospital performance, these practitioners had to make sure that the Hospital system functioned, even if this was achieved at the expense of lessening support for the stroke care pathway.

Moreover, the staff scheduling system contributed to the discrepancy between patient demand and resourcing. This had an impact on patient flow, resulted in mismanagement of resources and negatively impacted the integration of practitioners. Although a single

pathway is coherent, when this is implemented in a hospital with multiple other pathways and treatments it can become incoherent

Finally, pathway competition with the overall hospital portfolio was evident in the conflicting KPIs. Although pathway designers attached targets to the pathway, in order to control and coordinate the work of practitioners, these conflicted with multiple other Hospital targets and goals. The existence of multiple KPIs across the Hospital influenced the work of practitioners and induced an informal patient prioritisation system. Practitioners focussed on meeting governmental and institutional targets instead of patient satisfaction, resulting in patient flow issues (i.e. bottlenecks, inefficient allocation of resources) and subsequently, inter-professional collaboration issues.

5.2 What are the challenges associated with implementation of standard work in a professional (healthcare) operations setting?

Although the care pathway focuses on a single medical condition and an individual patient, its general framework creates interdependence between multiple healthcare practitioners (van Leijen-Zeelenberg *et al.*, 2015). Each practitioner brings only a partial amount of the knowledge and skills required for patient care. At one level this is another recognition of the fact that the Hospital as a healthcare organisation actually comprised multiple sub-units, typically structured around different professional groupings and individuals (e.g. ED, ASU and RD staff). These specialisations can endow sub-units with significant power and influence and in turn, have an impact on pathway adoptions (Kaplan *et al.*, 2012; Dionne S. Kringos *et al.*, 2015).

One approach to resolving this challenge is teamworking. In healthcare teamwork is defined as a dynamic process involving two or more practitioners with complementary backgrounds and skills, sharing mutual care goals for their patients, and exercising rigorous physical and mental effort in patient care (Deneckere *et al.*, 2012). This is of particular significance for healthcare organisations, and especially for OM initiatives where collaborative practice and teamwork are challenging issues, and solutions are typically difficult to put into practice (Gannon-Leary, Baines and Wilson, 2006). Research has demonstrated that the efforts of individuals to collaborate are affected by numerous distinct factors that may be supportive or obstructive to the standardisation of professional work (Irajpour and Alavi, 2015). In regard to the stroke care pathway, those factors are the practitioners' disparities in mental model of care (defined as competence and professional

interest in stroke care), the subsequent hierarchical structure of authority that it creates, and co-location of practitioners challenged with the implementation (of standard work) in a professional healthcare service operations setting.

5.2.1 Incongruence of mental model of care

Incongruence between different practitioners mental model of care was found to undermine the adoption of the pathway. Incongruence of mental model of care implies variation of practitioners in their competence and interest in stroke care. As illustrated in the previous chapter, practitioners tend to have different medical and coordination understanding regarding the stroke care pathway. None of the practitioners provided the same description of the pathway during the interviews. Although the very abstract form of the pathway was similarly described from most of them, small but important coordination details varied in their description. Similarly, there was considerable variation in the medical knowledge between them associated with their interest in stroke care. The extent of congruence around shared medical goals and objectives impacts team collaboration (Gittell, 2011). Each practitioner perceives a patient's situation from his/her own unique perspective. However, the point of fruitful collaboration is found where these views and approaches are integrated with the common aim of realising an optimal quality of care (Käppeli, 1995). HOM scholars have argued that when staff have a direct emotional or practical attachment to each individual work product (i.e. each step of the pathway), they can be more effective at collaborating and delivering high quality care (Bateman and Rich, 2003; Waring and Bishop, 2010). Following this dynamic, practitioners do not only work towards personal or group objectives, but rather, are focussed on the success of the whole organisation, offering better quality of care and supporting one another accordingly. This rationalises operations and helps everyone involved to approach tasks in an effective manner.

Likewise, in the Hospital when practitioners were more knowledgeable about stroke care, their collaborative work was observed to be more accurate and efficient at supporting patient flow. Regarding the practice of informal prioritisation of stroke patients noted in the subsection above, the analysis in this study illustrates that medical competence and interest in stroke care reduced the issue of informal patient prioritisation, supporting pathway flow. Within the ED staff known to have a particular interest in stroke care were observed to prioritise the care of stroke patients among all the other existing clinical pathways (see Table 4.5: inter.64, 65). For example, as already shown in the previous chapter, when the ED doctors who were specialists in stroke care were in charge of the stroke patient, they were

observed at always being present and accompanying the SNPs through the whole patient pathway.

Conversely, when medical staff were not specifically interested or competent in stroke care, prioritisation of stroke patients was different and care was perhaps less efficient. The decision-making process was delayed since practitioners required more time and resources to carry out their tasks (see Table 4.5.: inter.46, 48, 64-66). Similarly, their motivation to engage in the stroke pathway varied, resulting in other staff sometimes being required to undertake their tasks. For example, as shown in The case study chapter, regularly the SNPs and stroke doctors carried out the patient assessment and decision making process without any ED staff being present (see Table 4.5.: inter.37-45). This unavoidably led to further variations in the pathway and the patient. As noted above, due to limitations on Hospital resources, there was only one SNP available to take charge of incoming patients, thus when patient demand increased, it was very challenging for the SNP to facilitate more than one patient arrival at a time. In those cases, especially the support of ED staff was observed to be very important in order to achieve quality of care and avoid continuous pathway variations. Thus, ED staffs' absence from the process, impacted the work of other professionals, since the SNPs did not have both the clinical knowledge and authority to complete the decision-making process. SNPs would seek assistance from the ASU doctors, or other ED senior doctors for tasks such as assessing the patient, making a diagnosis, ordering of medical tests etc. These practitioners would then also have to pause their current tasks to assist with the pathway. But, as previously noted, interruptions to the process have a negative impact on the patient, the practitioners and the process. This is another indication of the highly interdependent nature of the pathway and the need for practitioners to collaborate effectively to achieve pathway standardisation.

Predictably, the level of practitioners' competency and commitment to stroke care also had a noteworthy impact on individuals' relational resources supporting pathway adoption. Stroke care specialists were observed to trust and respect the professional judgments of colleagues who were more competent/interested in stroke care, than those colleagues who were less so, and were consequently more motivated to work with them:

“So, we have got a very good relationship with Dr X. I feel very safe that we have somebody who is an advocate for stroke in ED and I think when he is there patients are given the right care. I think when he is not around, then the standard of care is a bit more variable and can affect the outcome” (SD 2)

And, ED2 said:

“If you have for example somebody like Dr X (ED doctor interested in stroke care) to run this pathway, it is his baby, it is his thing to drive the care of stroke patients. I am sure he is probably better than any of us at getting things done” (ED2)

As illustrated in The case chapter, practitioners' relational resources enhanced their communication both for exchange of administrative information and during the decision-making process (see Table 4.5.: inter.:69). Scholars who have explored trust and teamwork issues call this ‘competence-based trust’ (Mayer, Davis and Schoorman, 1995; Ibrahim and Ribbers, 2009). Competence-based trust is based on the trustee's abilities, skills and expertise that facilitate performance within a specific domain (Mayer, Davis and Schoorman, 1995; Ibrahim and Ribbers, 2009). When colleagues feel confident in the knowledge and skills of the people they work with, they are subsequently motivated and willing to collaborate with them. Similarly, in this study, in the instances in which the SNPs knew that the ED doctor in charge of the patient was not competent/interested in stroke care (from previous pathway experiences) they immediately contacted an ED doctor or ASU stroke doctor who they knew to be more knowledgeable and experienced in the pathway resulting in variations to the process. As Feldman and Pentland have noted in various works (Feldman, 2000; Feldman and Pentland, 2003; Pentland and Feldman, 2005), enacting organisational routines entails reflection, which subsequently allows participants in routines to amend future routines, thereby generating change.

Mutual respect for the work of colleagues motivates care practitioners to act in line with the goals of the overall work process rather than just their own departmental or individual goals (Hoffer, Gittel, 2002). Continuous disjointed collaborations between practitioners however, induced conflicts and tensions between them, eroding their willingness to collaborate in future:

“Obviously at the weekend we have a problem getting the scan ordered because the radiologist is just rude and grumpy. So, things like that do not help” (SNP 2)

In many instances tensions and conflicts between practitioners were observed during the pathway practice. For example, there were some cases where SNPs were observed continually complaining to the researcher and amongst themselves about the failure of the ED and the RD staff to collaborate, and they sometimes spoke in an aggressive way. On one particular morning the ED staff failed to inform the SNP of the arrival of a stroke patient,

and when the SNP discovered this, she became very angry. The SNP was rude and dismissive with the ED staff for the remainder of the day, complaining about their behaviour both to the ASU team and some of the ED nurses. This undoubtedly had a negative impact on the care process.

Similarly, on another occasion Patient A was admitted to the Hospital in the afternoon. The ED nurse informed the SNP, who consulted the electronic medical records (EMR) to check the patient's symptoms at time of admission. The patient was admitted with 'slight confusion' and the SNP was reluctant to go and assess him immediately. When the researcher asked the SNP why she was unwilling to go, the SNP replied:

"I do not want to get involved with the patients who were admitted to the ED with a suspected stroke. Because I feel that whenever I go down [to the] ED, I do everything for the patient. ED staff step back and in the end, the patient is diagnosed without a stroke."
(SNP2)

In that instance the ED doctor did not diagnose a stroke, and discharged the patient from the Hospital. However, Patient A was readmitted to the Hospital the following day, diagnosed by an ED doctor with a stroke and followed the pathway. Although this was a single case in which the researcher was able to observe the impact on the patient, it was not the only occasion where the SNPs were observed to be reluctant to get involved in the pathway immediately. This had an impact, both on the patient, and on Hospital resources (i.e. replications of medical tests etc).

Hence, differences in practitioners' mental model of care and its influence on their motivation to adopt and implement the pathway, had a considerable impact both on their collaboration, the pathway and the patient. Practitioners have the power to act autonomously, and the failure of the pathway design to consider, coordinate and balance this autonomy inhibited its subsequent adoption.

5.2.2 Hierarchical structure

The literature review strongly suggested that high levels of knowledge specialisation create strong hierarchical organisational structure, and observations at the Hospital confirmed this. Differences in practitioners' roles was a source of power dynamics impacting negatively on knowledge sharing and learning amongst them (Adler *et al.*, 2003; Tucker and Edmondson, 2003; Tucker, 2004, 2007; Van Der and Bunderson, 2005; Joosten, Bongers and Janssen,

2009; Nembhard *et al.*, 2009; de Souza and Pidd, 2011). Hierarchical structures have been shown to challenge professional communication and collaboration in several studies examining the quality of healthcare practice (Tucker *et al.*, 2014; Powell and Davies 2012; van Leijen-Zeelenberg *et al.*, 2015).

Evidence of this tendency was observed in the reluctance of junior practitioners to express their thoughts about issues and difficulties, or to complain to senior colleagues. For example, when the SNPs faced issues with ED senior doctors, they voiced their concerns and showed their annoyance to stroke team colleagues, but not to the ED doctors directly. Rather than insisting that ED senior doctors assist them with the care process, the SNPs repeatedly requested that ASU doctors come down to the ASU and assist them. When the stroke doctor subsequently arrived, the SNPs would usually voice their complaints to them about the lack of collaborative working from the ED doctors. This meant that important feedback on the ED senior doctors' ability to practice effectively was unavailable to them, since often they were unaware of the impact that their lack of collaborative behaviour had on the work of SNPs and subsequently, the stroke care pathway. The researcher observed several discussions between ASU practitioners, about lack of collaboration from ED staff.

In contrast to their reticence to challenge ED doctors, the SNPs were observed on numerous occasions being more forceful and blunt in their communications with ED nurses if they felt that they were not committing effectively to their tasks. Since the SNPs and ED nurses shared the same professional hierarchical position, the SNPs felt more comfortable expressing and showing their dissatisfaction and, at times, annoyance to the ED nurses. Similarly, with the RD practitioners, the SNPs could more easily express their concerns and dissatisfactions to the junior members of the team (i.e. radiographers) rather than more senior practitioners such as the senior radiographer. On one occasion during out-of-hours of care (Saturday afternoon) the SNP was observed trying to contact the Radiologist to request a CT scan. The Radiologist seemed to be abrupt and unco-operative on the phone (as the SNP explained afterwards). However, the SNP remained polite with the radiologist, but on arrival at the RD later, the SNP made complaints about the Radiologist to the more junior Radiographer.

Interactions between practitioners and the Hospital Managers also influenced practitioners levels of motivation to exchange information and engage in collaborative behaviour. There was a pre-existing, and opaque, rewards/incentives performance system in place, and this further negatively impacted on trust in the organisation and the rewards/incentives system

and consequently, practitioners willingness to engage with the pathway improvement initiative:

“You know last month we met the targets for bringing ED patients on the ward within 4 hours. We did a great job and we proved that it is worth keeping us here. But we have not seen any improvement in the service. We basically stop hoping for something more. We do everything we do because we care for the patient” (SNP 2)

Similarly, RD 2 added:

“We (the RD staff) do not get this money. We do not really see this money at all, but the top management team does. We meet our targets, but none of us see where it goes”

Staff perceived themselves to be outsiders in the process of strategy development and quality improvement:

“I’ve started being apathetic since I have had no positive response to whatever I have been saying. I have suggested ideas to improve and noone seems to be interested” (SD2)

In many HOM studies, scholars have highlighted the importance of managers to engage frontline staff in the design, evaluation and improvement of projects and systems as a source of empowerment and motivation to fully engage them in improvement initiatives (Leape *et al.*, 2009; Innis and Berta, 2016; Tucker, 2016) and knowledge sharing behaviours (Radaelli, Lettieri and Masella, 2015). This builds employee trust in the initiative itself, and encourages the exchange and sharing of information, required for the improvement of the process (Löfgren *et al.*, 2012). Involving frontline employees in the project also yields more insights for managers into how and why the process can/should be improved in order to achieve the desired outcome of improvement. Frontline employees have in-depth knowledge about process issues and operational failures, and are key to deciding which problems should be selected for resolution efforts (Tyre and Hippel, 1997; Banker, Field and Sinha, 2001; Field and Sinha, 2005). Each individual brings unique information and perspective to the discussion that others cannot replicate. In this case, the failure to involve frontline employees in design of the stroke care pathway implementation strategy negatively impacted practitioners’ motivation to accept and contribute to its adoption.

5.2.3 Co-location and physical interaction

The location of practitioners and the subsequent interactions between them was found to impact knowledge sharing and the territories of professional autonomy. As noted above interactions between professionals (Nicolini et al., 2012) enables them to exchange information and develop a shared mental model of care in order to align their work. When professionals are located close together, they have the opportunity to discuss tasks and synchronise their behaviour (Feldman and Rafaeli, 2002). Observing the SNP and stroke doctor working with the ED staff it was notable that the SNP worked more efficiently with ED staff. Due to the nature of the role, the SNPs had significantly more interaction with the ED staff and, consequently, were more familiar with their working approach. In contrast, the stroke doctors usually based in the ASU, had limited interaction with the ED staff and environment, and found it more difficult to adapt to it when they needed to go and assess the patient:

“I do not know how they work down there. It is not clear like here (in ASU) where you know who manages which bed all the time. That might cause issues to the communication because it is not clear with whom to communicate. I try to go to the nurses around and ask them, but I am not sure if they are the right nurses looking after the patient” (SD 2)

From the perspective of the ED staff who were not stroke specialists, the fact that they were not able to interact frequently with, or observe the practices and outcomes of the stroke doctors' work, prevented them from building their knowledge; learning from the stroke doctors and reflecting on their own practice in order to build confidence and stroke care competencies. Scholars of ORs (Feldman and Rafaeli, 2002), knowledge management (Nicolini et al., 2012) and HOM (Dobrzykowski and Tarafdar, 2015; Drupsteen, van der Vaart and Van Donk, 2016) literature have also shown that when individuals are located in close proximity to each other they are able to observe colleagues while they carry out their own tasks and subsequently reflect on their practice (Kraut *et al.*, 2002; Sole and Edmondson, 2002). Drupsteen *et al.*, (2016) noted that process visibility is an operational antecedent of integrated patient planning. The authors explain that lack of process visibility is associated with inadequate knowledge regarding the interdependent nature of the process – the impact that individual and departmental actions have on the process itself and the work of the others. This mainly engenders lack of awareness, but also disincentivises collaboration (e.g. information sharing).

In the Hospital, ED staff had no contact with the stroke patients after these were discharged from the ED. Thus, ED staff were unable to reflect on their care practices and actions (decisions) and consequently, were unable to improve them. Particularly, ED1 stroke doctors noted:

“What the stroke doctors see regarding the health progress of the patient, we (the ED doctors) do not. I am familiar with the research on stroke care but I do not receive the information that comes through the practice. The stroke doctors see numerous patients and how they respond, how their health progresses. With this experience, they are better informed to know which treatments work and which don't. Whereas, I (ED doctor) do not know that, because I simply do not see the patient after she/he leaves the ED. So, they (stroke doctors) come with different practical experience.” (ED1)

Due to division of labour, practitioners only see a portion of their own overall performance. They have no access to sequential information upstream or downstream of their particular actions; thus when a patient arrives in their department, they complete their part of the care process and send the patient to the next stage. This does not allow them to reflect and improve upon their practice.

Additionally, frequent interactions between individuals have been found to reduce territoriality and antagonistic behaviours (Cilliers, 1998). Individuals were observed to be less judgmental and more understanding and supportive towards colleagues working in close proximity to them. For example, the researchers could clearly see the compassion and understanding of SNPs towards the other members of the stroke team:

“You see one would say: "why are they not (the stroke doctors) more proactive at seeing the patients when they come in?" The trouble is their heavy workload on the ward as well. We know how they work, so we do not blame them” (SNP 2) (see also Table 4.5.: inter.58)

“I think it all depends on how you ask and you work with the staff. You have to be very mindful of their workload on this ward, we see them every day. We know how it works. ...you know you need to liaise and work with the staff. Be patient with them.” (SNP2)

Seeing and understanding the work of colleagues at close proximity meant that practitioners made more accurate judgements about the reasons for those colleagues' actions. This reduced the tendency for conflicts to arise between them, and additionally provided enough

information and understanding about the colleagues to predict their future behaviours. This in turn enabled practitioners to accommodate variations in colleagues' performances and to support them when needed. Fitzgerald *et al.* (2007) call this 'theory of mind'; "the ability of individuals to understand others' behaviours, mental states and intentions, and use this knowledge to advantage".

Furthermore, physical proximity between the different practitioner groups also facilitated shared learning and knowledge acquisition through the enablement of a collective process of reflection on the pathway. Group level reflection on routines is another crucial factor in routine change since it fosters learning and the articulation of knowledge (Edmondson, Bohmer and Pisano, 2001; Lazaric, 2008). As Pentland and Feldman (2005, p. 809) note, when routine participants have opportunities to collectively reflect on routine performances this can contribute to change and eliminate the influence of individual agency. Similarly, Edmondson *et al.* (2001) and Dittrich *et al.* (2016) have shown how collective reflection on a routine may facilitate routine change over time by promoting shared knowledge of the routine. Dittrich *et al.* (2016) have found that there are 2 types of collective reflective talk; formal and informal. Importantly, both forms articulate and refer to the performative and ostensive aspects, but in one form, the focus is on the former, whereas in the other, the focus is on the latter. Consequently, participants point out different types of problems and opportunities as well as risks and contingencies. Engaging in talk supports collective reflection, which in turn facilitates different types of problem solving.

Specifically, Dittrich *et al.* (2016) explored how interaction and particularly talk among the individuals' is a form of collective routine reflection which leads to, and shapes, routine change. They explain that the ability of individuals to interact and talk, allows them to share and discuss their concerns, issues and difficulties regarding the process and to suggest improvement options, which play a crucial role in producing stability or change to routines. It was certainly the case in this study that practitioner groups/individuals located in close proximity to one another were found to be better able to arrange and participate in formal staff meetings to discuss pathway and/or patient issues. The RD and ASU teams in particular were located on opposite sides of a corridor (Picture 5.1., B6 (ASU) and B7 (RD)) and were thus able to arrange formal meetings more frequently:

"The stroke doctors have regular meetings with the radiologists. They are very close to us. So, there is collaboration there. We get invited to their stroke meetings and we get the

opportunity to meet regularly with the stroke team. I feel we get good communication from them” (RD1)

In contrast the ED practitioners were located at a distance of approximately 600m, which seemed to impact their ability to attend the meetings that they were invited to at the ASU. Due to their business, practitioners’ were less motivated to attend staff meetings, especially if those were located at a considerable distance to their workload:

“I think part of the problem is that it is very difficult to get the ED staff to all sit together and discuss issues. We have thrombolysis meetings where we discuss all the thrombolysis taking place and their outcomes, and they have been invited to attend. We have never had an ED attendance. To stop what they are doing is even more difficult” (SD2)

SNP1 added:

“...thrombolysis meetings are now taking place in our department and that makes it more difficult for the ED staff to engage” (SNP1)

And, SD2 added:

“I was thinking, if those thrombolysis meetings were actually taking place in their department (located next to the ED medical area), that would be different. These are now taking place in our department and that makes it more difficult for them to engage.”

The impact of staff meetings and individuals’ interacting to discuss the process have been shown to improve collaboration between practitioners and reduce conflict, supporting process standardisation (Dittrich, Guérard and Seidl, 2016). Due to the fact that practitioner groups involved in delivery of the stroke care pathway never met together to collectively reflect on routine performances (and to subsequently develop a shared understanding of the process), a collaborative approach to delivering the pathway was not developed. Some practitioners acknowledged the need to arrange those formal meetings in order to address this:

“Because when you sit together, when you have got problems, you find solutions. And we need to meet all together. If you have a formal meeting every month, just to meet and discuss the very good and bad cases, just for us to improve, that would be great, that would help all of us to improve” (SD 2)

Moreover, the location of the individuals concerned also facilitated informal collective reflection processes on pathway performances, supporting pathway improvement and adoption. These reflections could take place on occasions such as coffee breaks, social staff gatherings, or even in their department while they were providing care to the patients. For instance, they were quite often observed expressing to the stroke doctors and nurses their complaints and concerns regarding their collaborative problems with the ED and RD staff, during their coffee or lunch breaks (these took place in a small kitchen in the ward). During these discussions, different options for overcoming issues were suggested and discussed.

It is important to note however that the context in which individuals interacted contributed to the effectiveness of that particular reflection on routine performances. For example, interactions between the ASU staff and the ED staff primarily occurred within the delivery process of the stroke care pathway. This was usually in a high-pressure environment where practitioners had to complete multiple tasks within a short space of time, and thus conversations were invariably short, limited and consequently not very effective. However when practitioners had the opportunity to engage in conversations in a less stressful environment (e.g. coffee breaks, social events) their reflections on routine performances and their actions within them seemed to be more effective. The importance of having time to properly articulate reflections is supported by Tucker *et al.* (2007) where the authors showed that, when nurses were given more time, they were better able to discuss, think through and more thoroughly evaluate their actions, enabling them to identify root causes of failure and engage in effective improvement ideas. Conversely, when less time was available, nurses were spontaneously correcting problems as they arose, with limited interaction between them, leaving a window open for repetition of mistakes. Some empirical studies (Alt-White, Charns and Strayer, 1983; Baggs and Schmitt, 1997) have also determined that the physical proximity of professionals in the workplace, and whether or not they had the time to meet, is a factor in the development of collaboration.

Consequently, when an OM initiative is introduced in a professional autonomous organisation, the geographical aspect of the process and the associated locations of professionals has a considerable impact on knowledge sharing and learning behaviours. Subsequently, the motivation of professionals to accept and contribute to the improvement of the initiative is also impacted. Creating a congruent pathway, mental model and supporting relational resources among the professionals, is vital for balancing the impact of autonomy on the effectiveness of the model.

5.2.4 Summary

In this second sub-section of the discussion chapter the key challenges associated with implementation (of standard work) in a professional service operation setting (i.e. with significant individual autonomy and independence) have been illustrated.

Incongruence of practitioners' mental model of care that is associated with high degrees of professional autonomy had a negative impact on the pathway flow. Practitioners that were less knowledgeable and interested in stroke care appeared less motivated to prioritise stroke patients, creating a staff blurring issue. This led to an incoherent process due to the continuous interruptions caused by practitioners seeking clinical or administrative information from colleagues, in order to proceed with the tasks at hand. These effects resulted in a lower quality of relational resources (i.e. less trust, more conflict) thus challenging the willingness and ability of staff to work collaboratively.

The high levels of knowledge specialisation inherent in healthcare result in a rigid organisational hierarchical structure. This had a subsequent negative effect on the collaborative ability of practitioners. Fewer senior staff appeared less motivated, and less willing, to exchange information that was important for the improvement of pathway performances with more senior colleagues. The political power inherent in certain practitioner roles and groups also limited the ability of practitioners to enhance their social capital, which is vital for sharing knowledge and achieving positive outcomes from collaborative work.

Finally, the location of professionals worked as an under-utilised mechanism for reducing and balancing the negative effects of professional autonomy. This supported knowledge sharing among the professionals, facilitating the creation of a shared mental model of care, and building practitioners social capital that subsequently increased motivation levels and practitioners' ability to collaborate successfully in support of pathway adoption.

To summarise the Discussion chapter, a table with the key findings is provided below:

Research Question 1: What, if any, are the distinctive characteristics of standard professional/judgement (healthcare) work?		
	Description	Findings
Formalisation of the pathway	Formal design of the pathway and its component processes had an important impact on how practitioners interacted with each other resulting in variations to the process	<ul style="list-style-type: none"> • <i>Geographical interaction:</i> Formal geography of the pathway and the associated distance between the practitioners impacts patient flow • <i>Interaction with the artefacts:</i> Failure of the pathway designers to capture the practical reality of the organisation within which it was to be implemented resulted in pathway coordination issues and misalignment of the pathway with the overall Hospital portfolio.
Fragmentation of capacity	Hospital resourcing managed locally created significant barriers to successful pathway adoption when multiple pathways were integrated together. This impacted both, pathway capacity and inter-professional collaboration.	<ul style="list-style-type: none"> • <i>Compartmentalised/ departmental and functional silos approach:</i> each department focuses on meeting their intra departmental goals and associated use of resources, creating conflicts between them and consequently, pathway resource capacity issues (i.e. informal patient prioritisation system). There is a political dimension to resourcing. Clinical departments that have control over their allocation of resources, and share these among multiple professional groups are in a powerful position. When the goals and interests of the relevant professional groups vary, this weakens pathway adoption. • <i>Hospital scheduling system:</i> challenged pathway adoption both in terms of efficiency (i.e. timeliness, availability of resources) and effectiveness (i.e. quality of decision making process).
Conflicting Key Performance Indicators (KPIs)	Misalignment of the pathway targets with the other pre-existing portfolio targets and goals, induces ‘quasi-competition’ of the pathway with other hospital treatments and pathways for the necessary resources.	<ul style="list-style-type: none"> • <i>Informal patients’ prioritisation system:</i> The existing pathway KPIs motivated practitioners to a particular way, undermining both pathway performances (i.e. unavailability of resources) and of the whole Hospital portfolio. This issue is also associated with practitioners’ professional autonomy and consequently, being able to make decisions that do not support pathway performances. • <i>Pathway mis(measurement) system – professionals:</i> conflicting targets and subsequent interest of professional groups resulted in wrong use of performance measurement pathway schemes and subsequently, challenges pathway efforts for improvement.
Research question 2:		

What are the challenges associated with implementation of standard work in a professional (healthcare) operations setting?		
Incongruence of mental model of care	Differences in practitioners' mental model of stroke care (i.e. skills, coordination and medical knowledge) undermined pathway performances.	<i>Challenge inter-professional communication:</i> variations in practitioners' competence on stroke care associated with professional autonomy had an impact on the efficiency (i.e. timeliness) and effectiveness (i.e. accuracy) of their communication (both for administrative and decision-making exchange). This had a subsequent impact both on the pathway (i.e. timeliness, use of resources) and patient outcome.
Hierarchical Structure	High levels of knowledge specialisation creates strong hierarchical organisational structure, challenging pathway adoption. Differences in practitioners' roles was a source of power dynamics impacting negatively on knowledge sharing and learning amongst them.	<i>Challenge inter-professional communication:</i> differences in practitioners' hierarchical level impacted on their willingness/motivation to exchange important information (i.e. issues, complaints, mistakes), being important for the pathway performances and improvement. <i>Engagement of the frontline employees:</i> Interaction of the frontline employees with the hospital managers and engagement with the project design and improvement affects their motivation to engage with them.
Co-location and physical interaction	The location of practitioners and the subsequent interactions between them impacts knowledge sharing and the territories of professional autonomy.	<i>Impact on inter-professional communication – reflective process:</i> Practitioners located closer to each other were able to exchange information both orally and virtually, enabling them to reflect and subsequently, improve their actions. <i>Impact on practitioners' relational resources:</i> Practitioners who tend to work closer to each other or have frequent physical interaction have the opportunity to develop better working relationships which support their collaboration (i.e. communication and co-operation).

Table 5.4: Summary of the key findings explaining the variation of stroke care pathway

6 Conclusions

The research reported in this thesis set out to explore a typical OM theme, the process of standardising work, in a typically complex and knowledge intensive setting. The potential impact of process improvement (of which standardisation is a key element) to healthcare systems is widely accepted; resulting in any number of practical initiatives intended to transfer established ‘industrial’ methodologies and roadmaps to this novel setting (Juan and Ou-Yang, 2004; Aurich, Ostermayer and Wagenknecht, 2009; Dassisti, 2010; Cottyn *et al.*, 2011). Scholars in healthcare OM note, however, that there have been very few studies that try to understand the principles of adoption for such process improvement initiatives (Reijers and Liman Mansar, 2005). Ponsignon *et al.* (2014) state that the implementation of such initiatives remains more “art than science” (Limam Mansar and Reijers, 2007). By combining OM and adjacent theoretical insights with an in-depth case study the thesis investigated how a stroke care pathway – the clinically optimal sequence and timing of interdisciplinary care for stroke patients (Ignatavicius and Hausman, 1995; Campbell *et al.*, 1998) – was implemented in a UK hospital.

The objectives of this research were twofold. Firstly, to enhance theoretical understanding of OM type interventions in complex, knowledge intensive settings and thereby, in particular, to contribute to the healthcare operations management sub-field (Swinglehurst *et al.*, 2011). Healthcare operations are made up of multiple actors with varying degrees of individual autonomy and accountability, interacting with multiple technologies, engaged in knowledge intensive and judgmental work and requiring extensive coordination (Tucker and Spear, 2006). When ‘official’ care pathways are introduced in such a context, their success is significantly influenced by macro and micro-level phenomenon. Failure to consider these elements into theoretical explanations - and practical guidance - can generate contradictory and potentially misleading results. Secondly, the work aimed to generate pragmatic guidance for healthcare improvement. Although the impact of care pathways on patient health outcomes has been extensively discussed, the processes of their adoption are less well understood (Saint *et al.*, 2003; Deneckere *et al.*, 2012). In this final chapter, after reflecting on the limitations of the study, key conclusions are summarised and managerial implications highlighted. The chapter concludes with discussion of promising avenues for future research.

Limitations of the study

Before outlining the key conclusions from the work, it is important to reflect on some of its limitations. An inevitable limitation of any doctoral thesis is that the research is carried out by a single researcher and, consequently, researcher opinion and beliefs cannot be completely eliminated in the analysis and interpretation of the data, but more specifically:

Firstly, this was an exploratory study and although established literature was used to frame the investigations, there was no formal hypothesis development or testing. The empirical setting offered the invaluable opportunity to investigate clinical care pathway implementation, but it was a case study of a single clinical care pathway in a single organisation. Equally, although the research employed formal data collection protocols (triangulation, coding, etc.) derived from a conceptual framework itself informed by literature; inter-personal differences (i.e. native language, cultural assumptions, educational background, etc.) between the researcher and the participants can never be completely eliminated.

Secondly, attempts to triangulate primary and secondary data were limited by considerable differences in the structure, completeness and timing of nominally identical variables reported by two key departments. Attempts were made to merge the two datasets, but more robust quantitative tests were not completed as a result.

6.1. Care Pathways have multiple dependency dimensions (i.e. not just flow)

In the study there were very strong observations that actively confirm previous findings and observations in HOM and ORs literatures.

6.1.1 The care pathway is flow and path dependency

In line with OM's dominant process conceptualisations, the stroke care pathway is clearly a flow dependency (Malone *et al.*, 2005). Based on extensive analysis of clinical outcomes, it was designed at a national level to mandate the optimal 'to be' (or, using the language of the routines literature, the in principle/*ostensive*) care process, indicating which clinical, reporting, testing, etc. tasks should be performed in which preferred sequence (i.e. 'x', 'y', 'z'), explicitly recognizing that later tasks and patient outcomes are reliant on the output and timing of earlier ones (e.g. 'x' depends on 'y'). In considering how the pathway works in

practice (*performative*) the research also revealed ample evidence of a common feature of flow dependency, namely ‘unnecessary movement’ as a form of ‘waste’ (de Souza and Pidd, 2011). In the hospital setting, geographical (i.e. it is an old, small site) and organisation structural constraints (i.e. different departments have common locations, based in large part on history) necessitate multiple patient movements when following a specific care pathway. In a flow dependency, “unnecessary” movement between departments/resources/spaces creates variability and consequently has an adverse (typically escalating) impact on the timing and use of resources across the mandated pathway, and a possible negative impact on patient health, increased noise, etc.

Moreover, the pathway flow is predicated on effective and efficient information exchange between caregivers, but the different locations of the various practitioners restricted their ability to exchange information and share knowledge. It also hindered the development of trust/social capital, etc. which enhance professional collaboration and, consequently, support the flow. The study reinforced this observation, highlighting that those individuals who had superior social capital (perhaps the result of frequent interaction, etc.) were able to collaborate better, adjust in a timelier fashion to effectively manage any unexpected variation and to minimise the impact on interdependent flow.

Additionally, as suggested by the routines literature, the pathway is a path dependency. Different versions of the same pathways (the ‘as is’ old ways of working) and the working style of professionals (i.e. previous collaboration forms) do not cease to exist with the implementation of a new way of working. This has been observed in processes where workers have extremely limited autonomy (e.g. data entry) but the research highlights the significant scope for ‘legacy drag’ in a professional setting. The fundamental, and often overlooked, observation that *history matters* even in the detailed performance of apparently rational (in this case, medically optimal, etc.) processes, is based on the insight that social processes do not evolve in an unrestricted way, but are recursive (self-referential) in the sense that previous ways of working have an influence upon those that follow (Sydow, Schreyögg and Koch, 2009). For example, previous stroke care pathways did not include the role of SNPs, but this was implemented as a method of improving pathway performances, requiring professionals to work differently. However, adjacent healthcare professionals resisted adapting to the new way of working within the pathway (i.e. carrying out different tasks such as alerting the SNPs immediately when the patient arrived in the ED). Likewise, ED doctors were required to collaborate closely with the stroke doctors to ensure accurate

and consistent decision-making processes. Nonetheless, stroke doctors were found to be unwilling to assist the ED doctors whenever needed (i.e. walk down to the ED), since the close collaboration of those two professional groups was non-existing beforehand, but was a basic requirement under the new pathway adoption. The finding emphasised the idea that frequent and consistent interaction among the professionals facilitates the development of social capital and shared knowledge between them, supporting their collaboration and thus the adoption of new pathway versions.

These are important findings – with significant managerial implications – namely that any design should start with those two dimensions; flow and path dependency. Even the most optimal pathway will need to explicitly consider the impact of geographical constraints and organisational structures. Although pragmatically interesting, they are not conceptually novel, echoing as they do key lean production axioms, established HOM ideas (Gittell *et al.*, 2000; Tucker, 2004), etc. More interesting is a series of observations that the pathway simultaneously exhibits other dependencies. This is critical because even if formal pathway design focuses on managing flow dependencies and fails to recognise these other types of dependencies any implementation will fail to deliver effective performance.

6.1.2 The care pathway is also a resource sharing dependency

One of the key challenges observed in the implementation of the stroke specific pathway was that, once deployed (or once it moved from *in vitro* to *in vivo*) it no longer existed in isolation and was confronted with the need to interact with a range of other activities and indeed other specific care pathways. Consequently, pathways should also be conceptualised as sharing dependencies because multiple pathways are using the same resource sets. Examples include the scanning and ED resources shared between multiple patient groups (i.e. cancer, trauma, sepsis etc.) who also needed to have their scanning completed in a critical time range. Similarly, many Hospital resources (e.g. nurses, beds, etc.) are shared among numerous patient groups creating considerable variation to the pathway, with a common consequence being unavailability of said resources. The deployment of (physical) resources is covered in the HOM literature (Brand *et al.*, 2005; Buchanan *et al.*, 2005; Stirman *et al.*, 2012), but extant theory lacks significant explanation of how these resources are allocated and shared when they interact with multiple standardised pathways (i.e. with specific resource requirements – outside of traditional professional judgement – for resource use).

Such dependencies are even more significant barriers to implementation in a publicly funded healthcare system, like the NHS England, where organisations must operate with often quite significant resource constraints. In essence, creating a situation where a care pathway is competing with other treatments and activities for limited shared resources. Although OM researchers have highlighted the negative impact of variability in care, this study shows that attempts to blindly implement standardised work can also themselves create capacity issues. Specifically, the findings illustrate that even if a pathway is coherent, when this is implemented with multiple other pathways and treatments, it becomes incoherent. Fragmentation of capacity creates continuous interruptions in the process causing a negative effect both on its effectiveness (i.e. accuracy in decision making) and efficiency (i.e. timeliness and use of resources). Failure of the formal pathway design to consider and manage shared resource dependencies undermined its effectiveness and efficiency.

Returning to the specific setting of a publicly funded health system, the study highlights the (micro and macro, small p and big P) political dimension of resourcing – a contextual variable more evident in the routines literature than the HOM field. Due to the criticality of their resources for Hospital performance, Hospital departments involved in the care of multiple patient types, such as Radiology and Emergency departments, made decisions to use resources regardless of whether their actions were in conflict with the stroke pathway objectives. Therefore, there was a direct connection between pathway adoption, professional responsibilities/judgements, resource competition, and consequently political dynamics. This is a potentially unstable dynamic system that is underexplored in the HOM literature. Figure 6.1. summarizes these elements.

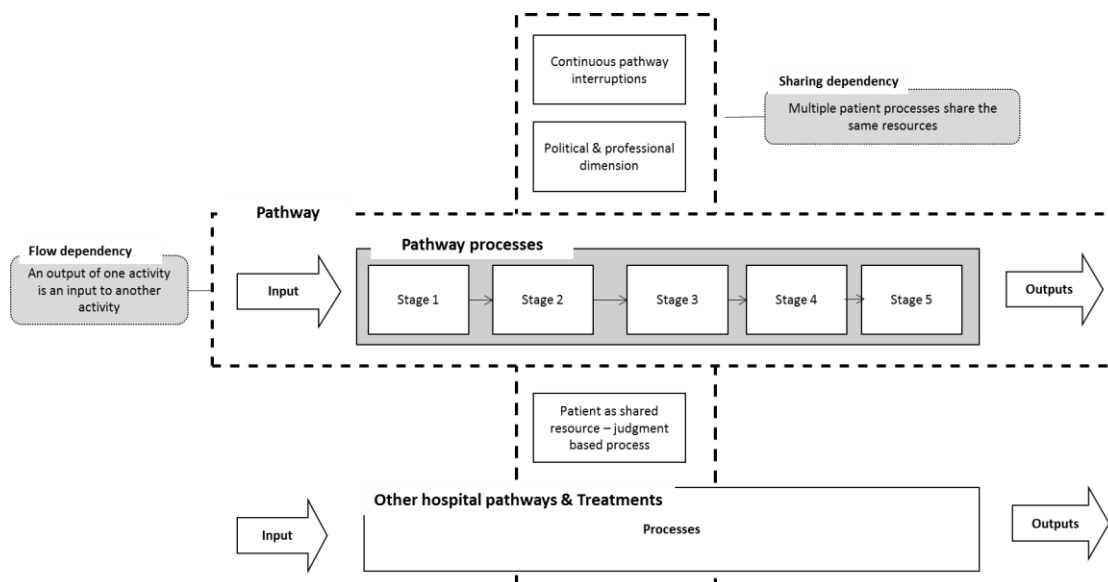


Figure 6.1: Beyond a simple flow dependency logic

6.1.3 The pathway is also a fit dependency

Extending the discussion of shared resources to the broader question of how a hospital (as the unit of analysis of the pathway in this instance) reconciles – or *fits* - all its different care pathways (explicit and implicit, formal and informal) together in a coherent way. The research confirms that such fit dependency issues were not considered in the pathway design; made manifest in a wide range of conflicting performance objectives. For example, stroke care pathway targets and goals (e.g. Brain imaging of stroke patients within 1 hour of their arrival at the ED, admission in ASU within 4 hours and others) were in conflict with the other organisational targets and goals, thereby creating another level to the informal competition between Hospital activities for the required resources (Klein and Sorra, 1996; Grove *et al.*, 2010). The critical managerial challenge in a fit dependency is to integrate these different ‘products’ into a coherent solution, but because healthcare necessarily combines the outputs from many different autonomous professionals, this limits traditional hierarchical influence (“cat herding”, etc.). Indeed, although variation and uncertainty in patients’ characteristics and their impact on healthcare process and decision-making have been discussed in the HOM literature (i.e. heterogeneity in patients’ characteristics - age, comorbidities etc. - underpins the *need for* judgement-based work) this study highlights that, in addition to such variation not being considered in formal pathway design, there are significant fit dependency consequences, in turn challenging attempts to manage a portfolio of care. Individual care professionals create variation in the care tasks *and* make decisions regarding which type of care is needed or is the priority. Although the care pathway approach

is a rational attempt to solve the flow dependency (integration) puzzle, in attempting to address the fit dependencies, there was parallel, strong and continuous, stress on performance measurement (Power, 1997) which autonomous professionals can easily undermine/game.

6.1.4 Towards a pragmatic process model

The discussion of pathway dependencies has highlighted that the idea of having complete control of treatment processes is problematic and that the implementation of standard work, whilst still a valuable ambition for healthcare improvement, is a multi-dimensional puzzle. Despite the extent of the challenge, based on this study, it is possible to make some practical suggestions regarding these process dependencies that have the potential to support pathway adoption and consequently achieve the desired end state of more standardised (and hence efficient and effective) care pathways. Table 6.1. below summarises the key dependencies identified and makes some tentative suggestions (based on observations and extant literature) regarding their management.

Dependency	Definition	Observed Solution	Observed Challenge	Alternative Approaches
Flow	(Care) tasks occur in a specific order, with later tasks reliant on the sequence, timing and output of preceding ones	Monitoring agents (called SNPs) in an attempt to react to changes in the relevant information resources or the environment, fuse the appropriate information, and notify the work coordination and collaboration processes.	<ul style="list-style-type: none"> •Limited power to control and manage the actions of other professionals and availability of resources 	<ul style="list-style-type: none"> •Software tools are widely used to manage this. Tracking task status and automatically passing work from one stage to the next. Specialised software tools could assemble the pathway outcomes into a patient specific record, to route (stroke) patient information/status/diagnostics to the various actors, but also then to detect and correct inconsistencies (e.g. why so long for a scan?). Although this may need some time to be accepted and successfully implemented in the Hospital, the researcher suggests that such a method will improve both individual pathway and Hospital operational performance. •Another suggestion is the construction of a pathway specialist team in the Hospital responsible for providing care to pathway patients admitted to the ED. These practitioners can carry other tasks when there are no admissions, but their main priority will be admitting stroke patients to the Hospital. This will eliminate unavailability of specialised care and predictable delays. The researcher recognises that shared knowledge will be more constrained and suggests that this team will be comprised from professionals with various skills who would like the opportunity to develop stroke care skills and competencies.
Path	Adoption of new pathway versions shaped by historical context of the pathway, and of the organisation within which it is implemented	<ul style="list-style-type: none"> •Use of technology (i.e. emails etc.), physical artefacts (i.e. posters etc.) and formal meetings to support knowledge acquisition of the new procedures. 	<ul style="list-style-type: none"> •Various protocols and guidelines were observed with different and incomplete guidance contained within them, creating variation in individual performances 	<ul style="list-style-type: none"> •Devote an agent to oversee and supervise the adoption of new tasks within the new version of the pathway, in order to detect and correct inefficiencies. •Provide feedback reports on the performances and operational improvements of the new tasks – encourage and incentivise practitioners to adopt those and acquire the required knowledge (i.e. learn from their own mistakes etc.)
			<ul style="list-style-type: none"> •Practitioners were not sufficiently aware of the role and availability of 	<ul style="list-style-type: none"> •Inter-departmental meetings should be obligatory with the participation of all front-of-house practitioners so as to support shared knowledge and development of social capital between them.

			each practitioner involved in the pathway	
			<ul style="list-style-type: none"> •Limited inter-departmental meetings took place and artefacts were mainly produced by high-level experts in the field with no value and insights from other – frontline practitioners 	<ul style="list-style-type: none"> •Utilising user-centred ontologies such as organisational roles, authorisations, user profiling, and other contexts required to create the appropriate views of information in a particular task), work process definitions, and detailed activity specifications; of the new tasks(Sheth, 1997)
Resource Sharing	More than one (healthcare) actor is using the same resource(s)	<ul style="list-style-type: none"> •Use of informal and formal protocols trying to clarify prioritisation between professionals – (i.e. stroke symptoms need to be prioritised etc.) 	<ul style="list-style-type: none"> •Variable protocols and guidelines were observed with incomplete information for practitioners with no specialist stroke knowledge 	<ul style="list-style-type: none"> •Various forms of markets and bidding. The time of practitioners potentially available to do (e.g. CT scanning) tasks is a critical shared resource; all the pathways could use ‘virtual’ bidding markets to manage this dependency (Malone <i>et al.</i>, 1999). The researcher acknowledges the limitations of such methods such as professionals not using at all/ or correctly the software, data being slow when there is an emergency creating considerable delays and medical errors etc. The UK government has tried to introduce market forces into the healthcare system, but has tried to do it at the organisational rather than individual resources level within the Hospital, so there is possible scope, but it could be controversial. It is suggested that some studies can be carried out to explore the implementation of such initiatives.
		<ul style="list-style-type: none"> •Use of KPIs attached to each pathway to manage decision-making for the allocation of resources 	<ul style="list-style-type: none"> •KPIs induced collaboration issues between the practitioners and the focus of practitioners on meeting individual and departmental targets, negatively impacting quality of care 	
		<ul style="list-style-type: none"> •Mix skills staff scheduling planning 	<ul style="list-style-type: none"> •Problematic staff scheduling system resulted in untimely and inaccurate decision-making process. 	

Fit	Multiple activities combined together	<ul style="list-style-type: none"> •An obvious way to cope with the ‘fit’ issue is to have someone in authority direct the implementation process. 	<ul style="list-style-type: none"> •Challenge of creating a clear Hospital agenda, defining patient prioritisation methods and communicating these with all healthcare practitioners. 	<ul style="list-style-type: none"> •Senior/experienced members of the Hospital and/or wider healthcare community could act as “co-pilots”; helping managers to define the pathway contests and help clinical staff to get the information/resources they need to compete effectively. Essentially, the managers specialise in coordinating the work of other specialities. •Greater attentiveness to prevent the risk of unwanted events. Like, in the airline industry in which customer safety is the most significant, employees use self-observation by mirrors, cameras (Kumar, 2007), or checklists. This has been applied in the different hospital settings such as operating rooms, and has proven to be effective. It can also be applied in care pathways to help practitioners to be more attentive to, and consistent in, performing their tasks (Gache <i>et al.</i>, 2014).
------------	---------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Table 6.1: Key pathway dependencies and suggestions regarding their management

At one level, the prescription is simple: the research clearly suggests that the national pathway was, given its objectives, poorly designed. It failed to consider the multi-faceted challenge of actual implementation (nb. a detailed study of this design process, although outside the scope of this work, would be a fascinating future study). Equally, hospital managers – arguably the key actors in managing the fit dependency dimension - inadequately understood the effect of the stroke pathway on, and from the perspective of, other pre-existing process dependencies. The confusion over KPIs suggests that a simple informational coordination mechanism is insufficient, and more directive and/or more creative interventions may be necessary. In the second section of this chapter, the focus turns to the role of the professional – recognising that they cannot be managed as simple resources and need to be an active part of the ‘fit’ (and flow and sharing) dependency challenge(s). The dependency framework proposed above offers a possible way forward for the improved design of future pathways.

6.2 Reconsidering the role of healthcare professionals in HOM

This research clearly suggests that the introduction of standard ‘professional’ work is more complex – via a series of additional (inter) dependencies – than a narrow flow conceptualisation would allow. Theoretically this requires us to stress the need for a multi-dimensional and multi-level model of process and more pragmatically, the need for clinical pathway design to recognise and engage with the different levels (national, organisational, professional) and, critically, with a fuller recognition of practitioners’ power in its performance.

It is widely accepted that healthcare professionals cannot be treated as standard controllable input to any process. The research confirms this but also highlights that the variations caused by autonomous practitioners making judgements in the “best” interest of the patient can generate contested outcomes. The observations of this study suggest that performative variation can be equally driven by well-understood flow and sharing dependency considerations (i.e. sub-optimal layouts, high-utilisation and high-variability resources), but there was also ample evidence of (often dysfunctional) competition between individuals and groups, who often lacked shared mental models of care, the best interests of the patient, etc. Here adjacent literature offers strong insight: professional expertise and status is entangled with concerns over individual accomplishment (Nicolini et al., 2012), socio material reward (Pentland and Feldman, 2008; D’Adderio, 2011) and individual and collective relations

(Hanks, 1991; Nicolini et al., 2012). In his seminal work on professions, Abbott (1988) argued that professionals have some key characteristics:

- Monopolistic/privileged knowledge expertise gained from particular training and previous experiences,
- knowledge work is interactive (i.e. diagnosis, inference and treatment) (Abbott, 1988) with the patients, non-professionals, colleagues and,
- performative acts - the procedural enactment of the profession where individuals create trust and acceptance from the ones external to it (Abbott, 1988; Harvey, Heineke and Lewis, 2016).

Perhaps this provides us with a structure for re-examining the role of professionals in pathway implementation. It should start with extensive interaction – local actors need to be involved in specifying (at least some aspects of) the pathway. Training is pivotal – with space for all professionals to refine the pathway; practice – and rehearsal.

6.2.1 Knowledge intensive/professional continuous improvement

The superiority of operational processes is regularly linked to employee engagement in innovative behaviours, such as producing and suggesting changes and participating in their implementation at work. As Mura *et al.* (2016) note important innovation at work might come from the “bottom” level (front-line employees) of an organisation. Consequently, healthcare managers should consider guiding and supporting professional actions in a manner of innovation, implementation and improvement to achieve more effective performance of their processes. Managers should trigger initiatives or embed those in the design of the processes to normalise innovation and a culture of continuous improvement. The continuous improvement of healthcare organisations as complex and integrated systems is contingent on the deployment of the specialised knowledge held by practitioners. The nature of healthcare professionals’ knowledge being tacit and made of stories regarding the knowledge of why, and how, to practice care (Alvesson, 2001) makes knowledge sharing difficult to manage and control from the perspective of healthcare managers (Radaelli, Lettieri and Masella, 2015; Mura *et al.*, 2016). This study confirms previous findings that show that knowledge sharing does not often arise instinctively (Currie, Finn and Martin, 2008; Radaelli, Lettieri and Masella, 2015). This study builds on the extant literature by showing how geographical fragmentation of the multiple professional groups enabled and

constrained the behaviour of knowledge sharing amongst the healthcare practitioners. Geography of the pathway constrained the physical interactions of practitioners hindering the development of a shared mental model. Professionals were not able to exchange information effectively and efficiently, nor able to (collectively) reflect on their actions and the actions of their colleagues.

An organisational hierarchical structure congruent with environments containing high levels of professional autonomy was also found to inhibit knowledge sharing among professionals. Although the impact of organisational and spatial boundaries on information exchange has been shown in previous HOM and ORs literature (Haque, 2010; Supper *et al.*, 2014; Tucker, Heisler and Janisse, 2013; Dittrich, Guérard and Seidl, 2016), this study, while confirming those findings, also emphasises that limited information exchange amongst practitioners undermined feedback processes, since it is of significant importance for the adoption and improvement of every QI initiative. Seeking and sharing feedback is connected to a higher idea of innovation implementation, which proposes that the conversation and information exchange of feedback embodies social exchanges used by employees to test the practical utility and use of new ideas (Radaelli, Lettieri and Masella, 2015).

Relational resources (social capital) of professionals were found to span such organisational and spatial boundaries, encouraging knowledge sharing between practitioners and supporting the development of a common mental model of care. Practitioners who had the opportunity to interact more frequently, and thus to develop better working and social relationships, (i.e. SNPs with the ASU stroke team) were more motivated to voice and share any issues or concerns that they had with their work. These findings support previous research on seeking feedback behaviour, which suggests that when employees share a high level of psychological safety, the exchange of information for mistakes or for seeking advice is correspondingly higher, because they tend to feel safer and are not afraid of being perceived as weak and/or incompetent. Conversely, if individuals do not have such strong relationships, sharing such information difficulties are less likely to happen. Such psychological safety is associated with the social capital – good relationships – of the actors involved. Additionally, professionals who share a common working environment have more and better opportunities to engage in both formal and informal conversations, facilitating exchanges of important information for the design, implementation and delivery of care. Thus, promoting the development of initiatives where practitioners engage in formal and

informal conversations is important for supporting knowledge sharing and consequently, practitioner motivation to engage in efforts for pathway improvement.

Relational resources between the hospital managers and frontline practitioners are also important to consider. This study shows that hospital managers had limited interaction with the practitioners, suppressing their motivation to engage with the efforts to adopt the pathway and improve it. Research in HOM examining empowerment of employees for improvement of their service has shown that the ability of all staff to express their opinions and participate in discussions for improvement motivates them to engage in efforts for improvement (Tucker and Edmondson, 2003). Due to the significant specialisation level of healthcare professionals, there is very significant need for collaboration amongst practitioners – located in multiple Hospital units – to acquire the knowledge needed in order to support pathway adoption.

6.2.2 The critical role of (process) artefacts

Process artefacts defined as “physical manifestation[s] of the organisational routines” (Pentland and Feldman, 2005) in documents or software are also a mechanism by which managers try to promote pathway knowledge - constrain, coordinate, control and improve work practices (Pentland and Feldman, 2008; Hayes, Lee and Dourish, 2011). Scholars of knowledge management argue that codification and systematisation of process knowledge through databases, patents, guidebooks etc. (Skaggs and Youndt, 2004) is part of the organisational capital that enhances knowledge sharing and improves organisational performance. Numerous scholars who study the role of artefacts in healthcare practice, have shown how healthcare professionals use artefacts to enhance their cognitive work and develop shared understandings regarding the nature of their work (Xiao, 2005; Nemeth et al., 2006; Wears et al, 2007; Colligan et al., 2010). The findings reveal that even for a single standard pathway implemented in a single hospital, there were multiple pathway artefacts. Visual representations were different for different professional groups: ASU stroke team, ED staff and Radiology department. The interesting question is the extent to which this is simply a manifestation/representation of ingrained points of difference, or whether the multiple pathway artefacts actually serve to exacerbate these performative differences. Cognitive science research has revealed the significance that external representations have on the performance of numerous problem activities (Zhang, 1194, 1997). Individuals from the different practitioners’ groups shared diverse competence on stroke care and the absence of sufficiently accurate (both medical and coordination); information undermined the

exchange of correct and timely information and decision-making. For example, not all the ED staff knew how to thrombolyse patients and the absence of such procedural information in the process artefacts resulted in breakdowns of the care process. Numerous scholars from different researcher traditions have shown that the way information is managed, organised and displayed impacts how people perform and interact with that information (Colligan et al., 2010). Research on human factors provided evidence that the arrangement and representation of information in visual displays has an impact on the people's ability to efficiently receive, extract and process information (Bennett and Flach, 1992). In their work Colligan et al. (2010) study the impact that different forms of process flow charts had on the outcome of QI work. The authors have shown that external representations, the types of process flow charts used from the professionals are not simply memory aids, but integral to the care practice and the way professionals perform their tasks. "External representations are directly perceived without the need for further interpretation and provide a structure for cognitive activity by constraining the range of possibilities" (Colligan et al., 2010, p.9). In their study, the authors found that co-ordination across organisational boundaries was not included in the process maps, but these were mainly focused on the tasks performance by healthcare professionals within the bounded context of their clinic. This prevented them from being able to accommodate any issue caused due to factors outside those boundaries. Critically, the organisation and form of a process artefacts can control and determine what information can be received and processed from the professionals. This can also govern what aspects of the problem space are evaluated and explored from the professionals especially when they have to perform new tasks or the same tasks with some novelty due to patient or situational variations (Zhang, 1997; Colligan et al., 2010)

This study highlights how a pathway artefact is a zone of two types of autonomy: that of the modeller who designs it and the professionals who use it. Even if artefacts are designed by the hospital managers to coordinate flow and standardise professional work, these are only aspect of the design process. The artefacts are then used by autonomous professionals who design and redesign the process differently every time they follow it. Professionals generally work with heuristics and rules. Professionals do not learn only from flow charts, but they study, see and apply, and learn from each other. Consequently, although pathway artefacts represent flow dependency, through their failure to recognise the professional autonomy associated with knowledge specialisation, their role as professional boundary spanners is tested. Authors such as Nicolini *et al.* (2012) and Mura *et al.* (2015) argue that professional expertise depends on, and develops through, the mediatory work of many artefacts that

professionals use to carry out their work. However, the findings of this study illustrate that when these artefacts fail to reflect the other mechanisms of professionals' knowledge acquisition such as traditional education and training methods; their interaction with the work setting; the patients and their colleagues, then their utility as a professional knowledge spanner is questioned. To improve the development of more authentic and pertinent artefacts, the researcher suggests that hospital managers and practitioners should promote the co-design of artefacts with frontline healthcare practitioners. Artefacts can be viewed as a type of formal contract between the modellers (hospital managers) and the practitioners who use it. Such collaboration between the practitioners and management could support operational performance in multiple directions. Firstly, this will work as a mechanism for sharing knowledge among the professionals – creating a common basis of understanding of how to carry out pathway tasks, capturing individual knowledge, goals and intentions and introducing these into the design such as to promote standardisation of the practices. Secondly, it will be an opportunity for professionals to meet, discuss and consequently develop a better understanding of the interdependent nature of their work and the associated impact of their actions on the work of colleagues. Thirdly, this collaboration would provide the opportunity for practitioners to reflect on existing processes, detect limitations and come up with improvement options. This will nullify the effects of professional autonomy, aligning practitioner and manager knowledge and objectives in support of pathway adoption and operational performance.

6.2.3 Towards a framework for professional/knowledge work-centric

The discussion of knowledge specialisation and the associated issue of professional autonomy emphasises that the idea of exercising complete control over professionals' actions is problematic and that standardising professional work, though still a valid target for quality improvement, is not an easy task to achieve. With the above considerations in mind, managing professional autonomy requires a complex strategy that would need to move in multiple directions. As Radaelli *et al.* (2015) note "A correct implementation of care pathways would in fact create the structural (e.g. knowledge inter-dependencies) and cognitive (e.g., shared goals) conditions to facilitate and motivate knowledge sharing". The findings of this study can make some practical suggestions regarding the knowledge sharing and process artefacts that are aimed at aligning professional autonomy in support of pathway adoption and improvement. Table 6.2. below summarise the two key elements and makes

some tentative suggestions (based on observations and extant literature) regarding their management.

Factor	Explanation	Observed Solution	Observed Challenge	Alternative approaches
Knowledge sharing and innovation	Spread and make healthcare providers and organisational knowledge accessible and usable within or between pathway participants	•Inter and intra-departmental formal meetings	•Limited formal meetings taking place only between 2 of the practitioner groups involved in the process – no discussion about issues/limitations and suggestions for improvements	•Arrange monthly meetings with the frontline practitioners in order to discuss routine performances, relevant issues and develop ideas for improvement. Their involvement in care practice should be interactive rather than passive.
		•SNPs as agents to facilitate information exchange among professionals	•SNPs were not expressing themselves/discussing issues and limitations of their work with senior ED staff •SNPs had limited/no power in controlling the competence/interests and associated actions of other practitioners, resulting in staff blurring issues, pathway timeliness issues and inaccurate decision-making.	•Social capital can be managed to stimulate knowledge sharing among professionals. Building social networks to shape individuals' self-efficacy and from the formation of cognitive/cultural pillars and the introduction of technological supports. Cohesive and tight social networks promote shared knowledge through individuals' influences on psychological safety to discuss process/work issues and suggest improvement options - creating a common social space for breaks, common training sessions etc. •Knowledge repositories and intranet are gradually becoming popular solutions (Radaelli <i>et al.</i> , 2015). Managers should study and consider organisational processes and identify the actual need for the implementation of such methods. Due to Hospital resource constraints, it is important that cost evaluation of such methods should be performed.
		•Performance measurement - Monthly feedback and performance measurement reports provided to the practitioners	•These reports were only focussed on process outcomes contested by professionals due to coding errors.	•Clearly identify professional and organisational measures (i.e. goals, knowledge limitations etc.) that need to be introduced in the performance measurement system. •An agent to control and coordinate performance measurement. Ensure consistency across the coding methods of the practitioners and share performance measurement reports among practitioners in a timely manner

				<ul style="list-style-type: none"> • Training sessions shared between practitioners should also take place to support knowledge sharing
		<ul style="list-style-type: none"> • ED doctors were allocated the task of carrying out stroke care independently (with limited/if needed support from the stroke doctors) in order to improve their stroke competence and skills 	<ul style="list-style-type: none"> • ED doctors were observed not participating in their tasks efficiently and effectively – requests were made for continuous assistance from the stroke team 	<ul style="list-style-type: none"> • Production of weekly reports from the specialist staff (ASU) including feedback on the actions of non-specialists (ED staff) on the patient and the process. These reports will enable the practitioners (non-specialised in stroke care) to evaluate their actions more effectively and improve them accordingly.
Process artefacts	<ul style="list-style-type: none"> • These are physical manifestations of the organisational processes in documents or software and are also a mechanism by which managers try to promote pathway knowledge - constrain, coordinate, control and improve work practices. 	<ul style="list-style-type: none"> • Hospital managers and designers produce artefacts to support knowledge acquisition and standardisation of the actions of professionals. 	<ul style="list-style-type: none"> • There were multiple pathway artefacts. Visual representations were different for different practitioner groups, devaluing their utility as knowledge boundary spanners resulting in pathway effectiveness and efficiency issues. 	<ul style="list-style-type: none"> • Defining the knowledge deficiencies/limitations of practitioners, the divergences in their interests and objectives and integrating those definitions within the pathway design is important in order to support their efficient and effective use. Co-design of pathways with practitioners from all the participant groups can be a solution. Practitioners (especially frontline) should participate in the design of artefacts – share their knowledge, and understand pathway interdependence etc. • Training sessions/ workshops should also be considered to support the acquisition of the required knowledge for the use of artefacts. Short periods of trialling methods for the use of artefacts are also important to consider in order to help detect limitations and issues and address them.

Table 6.2: Key elements of professional work and suggestions regarding their management

Clearly this research suggests that there is limited recognition and consideration of professional autonomy inherent within the existing efforts to design and implement the stroke care pathway. Pathway design and implementation fails to consider the heterogeneity of professionals in a multitude of respects – organisational (i.e. location), individual (i.e. values and objectives), professional (i.e. care competence) characteristics – and subsequently failed to account for these difference within efforts to standardise the practitioners' work. There was limited consideration of the needs of professionals to interact physically in order to exchange both administrative and medical information, and of the attendant need to develop social capital in support of motivating and engaging practitioners in pathway practice and improvement. Pathway modellers also failed to capture those characteristics in the design of the artefacts, which undermines their effective and efficient use, resulting in conflicting results (i.e. inducing variation to the mental model of care and thus to pathway performances). The framework of practical guidance for continuous improvement of professionals described above provides a possible way forward for the improved design of future pathways.

To summarise, this empirical study displays an important step towards the identification of the design characteristics of QI initiatives, in an information-intensive and autonomous service delivery system. A set of propositions have been formulated that can be used as a platform for theory development in the process of design and improvement are. These propositions provide a practical guidance for the improvement and adoption of QI initiatives in healthcare organisations:

1. The higher the physical proximity between professionals, the higher the effectiveness and efficiency of communication (both for administrative and medical information exchange, as well as for co-operation) between them.
2. Failure of artefact modellers to consider and account for professional autonomy in their designs, impairs subsequent effective and efficient use of the artefacts. Therefore, the greater the level of practitioners' involvement in the design and improvement process of QI initiatives, the greater their motivation (associated with knowledge and skills) will be for supporting their adoption.
3. Stronger relational resources of practitioners result in more efficient (i.e. timely) and effective (i.e. accurate) use of hospital shared resources supporting pathway performances.

4. Relational resources between healthcare professionals facilitate knowledge-sharing and eliminate the negative effects with respect to specific (care) judgements and subsequent differential interpretation (diagnoses, models of care), negotiations and consequential “turf wars”.
5. Alignment of the process improvement initiative’s characteristics such as goals, targets and objectives with the characteristics of the other pathways and treatments of the Hospital portfolio, will support the motivation of the multiple individuals (professionals) to collaborate in support of the pathway adoption.
6. Stronger relational resources of practitioners eliminate the negative impact of hierarchical organisational structure on practitioners’ communications, supporting their reflective behaviour and enhance pathway improvement.
7. All the practitioners who are involved in the pathway, the more engaged they are in the design of the pathway artefacts, the greater the possibility of them embracing and reflecting the reality of organisational and individual characteristics, supporting pathway adoption.

These propositions need further researcher and theory testing approach.

6.3 Future Work

Based on the findings and limitations of this study, the following suggestions appear timely in terms of possible future research. Firstly, replication via a bigger study and to try to integrate additional data in order to test the frameworks and clarify both the application, and significance, of each factor. The conceptual model of this research includes a substantial number of factors and mechanisms that may impact the implementation of OM initiatives in professional service organisations. The outcome is a multilevel model that is arguably too rich and complex to be dealt with empirically. This framework can provide a foundation for a framework for further research in which more frugal models are derived, through more accurate and rich approaches, and then evaluated to establish the most relevant factors and mechanisms in healthcare settings. Healthcare settings offer informative opportunities to test and build management theory, since they are characterised by high levels of complexity and uncertainty, while macro and micro realities coexist within them. It is important to note therefore that different healthcare professionals and the care pathways of other patient groups may yield divergent findings as they are informed by a diverse range of factors in terms of the organisation, unit(s), department(s) and patients involved. Consequently,

empirical studies should consider such differences as they might have considerable impact for any practical implication.

Secondly, the researcher was not able to observe the process while it took place during the night (8pm-5am). Future research may consider exploring and comparing care practices across temporal boundaries and how these boundaries can be spanned to achieve standardisation of clinical care pathways.

Thirdly, the impact of geographical interaction/physical proximity has only received limited attention in this research, revealing its impact on process performances. Future research can examine how geography of the processes support and oppose the work of individual practitioners in their efforts to improve quality of care.

Finally, the findings of this study illustrate that process artefacts play a significant role in promoting knowledge sharing, and in supporting process coordination and inter-professional collaboration. The research could analyse only archival documents, but future research might also analyse pathway artefacts in the form of software to better understand how these may constrain or promote pathway

References

- Abbott, A., 1988. *The System of Professions*. 1st ed. London: University of Chicago Press.
- Abell, P., Felin, T. and Foss, N., 2008. Building micro-foundations for the routines, capabilities, and performance links. *Managerial and Decision Economics*, 29(6), pp. 489–502.
- Adler, P. S., Riley, P., Kwon, S.-W., Signer, J., Lee, B. and Satrasala, R., 2003. Performance Improvement Capability: Keys to Accelerating Performance Improvement in Hospitals. *California Management Review*, 45(2), pp. 12–33.
- Agarwal, R., Green, R., Agarwal, N. and Randhawa, K., 2016. Management practices in Australian healthcare: can NSW public hospitals do better?, *Journal of Health Organization and Management*. 30(3), pp. 331–353.
- Al-Balushi, S., Sohal, A. S., Singh, P. J., Al Hajri, A., Al Farsi, Y. M. and Al Abri, R., 2014. Readiness factors for lean implementation in healthcare settings – a literature review. *Journal of Health Organization and Management*, 28(2), pp. 135–153.
- Allen, D. and Rixson, L., 2008. How has the impact of “care pathway technologies” on service integration in stroke care been measured and what is the strength of the evidence to support their effectiveness in this respect?, *International Journal of Evidence-Based Healthcare*, 6(1), pp. 78–110.
- Alt-White, A. C., Charns, M. and Strayer, R., 1983. Personal, organizational and managerial factors related to nurse - physician collaboration. *Nursing Administration Quarterly*, 8(1), pp. 8–18.
- Alvesson, M., 2001. Knowledge Work: Ambiguity, Image and Identity. *Human Relations*, 54(7), pp. 863–886.
- AMICE, 1989. *CIM-OSA: Open Systems Architecture for CIM*. Berlin: Springer-Verlag.
- Ancori, B., Bureth, A. and Cohendet, P., 2000. The economics of knowledge: The debate about codification and tacit knowledge. *Industrial & Corporate Change*, 9(2), pp. 255–287.
- Appleton, J. V and King, L., 2002. Journeying from the philosophical contemplation of constructivism to the methodological pragmatics of health services research. *Journal of Advanced Nursing*, 40(6), pp. 641–648.
- Apte, U. M. and Goh, C.-H., 2004. Applying lean manufacturing principles to information intensive services. *International Journal of Services Technology and Management*, 5(5/6), pp. 488-506.

- Armistead, C., Pritchard, J.P. and Machin, S., 1999. Strategic business process management for organisational effectiveness. *Long range planning*, 32(1), pp.96-106.
- Aroles, J. and McLean, C., 2016. Rethinking Stability and Change in the Study of Organizational Routines: Difference and Repetition in a Newspaper-Printing Factory. *Organization Science*, 27(3), pp. 535–550.
- Atwal, A. and Caldwell, K., 2002. Do multidisciplinary integrated care pathways improve interprofessional collaboration?. *Scandinavian Journal of Caring Sciences*, 16(4), pp. 360–367.
- Aurich, J. C., Ostermayer, D. and Wagenknecht, C. H., 2009. Improvement of manufacturing processes with virtual reality-based CIP workshops. *International Journal of Production Research*, 47(19), pp. 5297–5309
- Baggs, J. G. and Schmitt, M. H., 1997. Nurses' and resident physicians' perceptions of the process of collaboration in an MICU. *Research in Nursing & Health*, 20(1), pp. 71–80.
- Bailie, R.S., Robinson, G., Kondalsamy-Chennakesavan, S.N., Halpin, S. and Wang, Z., 2006. Investigating the sustainability of outcomes in a chronic disease treatment programme. *Social Science & Medicine*, 63(6), pp.1661-1670.
- Baker, A., 2001. Crossing the quality chasm: a new health system for the 21st century. *BMJ: British Medical Journal*, 323(7322), pp.1192.
- Baker, G. R., 2011. The contribution of case study research to knowledge of how to improve quality of care', *BMJ Qual Saf*, 20(1), pp. i30–i35.
- Banker, R. D., Field, J. M. and Sinha, K. K., 2001, Work-Team Implementation and Trajectories of Manufacturing Quality: A Longitudinal Field Study. *Manufacturing Service Operations Management*, 3(1), pp. 25–42.
- Bateman, N. A. and Rich, N. L., 2003. Companies' perceptions of inhibitors and enablers for Process Improvement activities. *International Journal of Operations & Production Management*, 23(2), pp. 185-199.
- Batista, L., Smart, A. and Maull, R., 2008. The systemic perspective of service processes: underlying theory, architecture and approach. *Production Planning and Control*, 19(5), pp.535-544.
- Becker, M. C. and Zirpoli, F., 2008. Applying organizational routines in analyzing the behavior of organizations. *Journal of Economic Behavior & Organization*, 66(1), pp. 128–148.

- Becker, M. C., 2004. Organizational routines: a review of the literature. *Industrial and Corporate Change*, 13(4), pp. 643–678.
- Becker, M. C., 2005. The concept of routines: some clarifications. *Cambridge Journal of Economics*, 29(2), pp. 249–262.
- Bennett, K.B. and Flach, J.M., 1992. Graphical displays: Implications for divided attention, focused attention, and problem solving. *Human factors*, 34(5), pp.513-533.
- Bevan, G. and Hood, C., 2006. What’s measured is what matters: Targets and gaming in the English public health care system. *Public Administration*, 84(3), pp. 517–538.
- Boaden, R., Harvey, G., Moxham, G., Proudlove, N., 2008. *Quality Improvement: Theory and Practice in Healthcare*, University of Warwick Campus, NHS Institute for Innovation and Improvement, (ISBN: 978-1-906535-33-9)
- Bohmer RMJ., 2009. *Designing Care: Aligning the Nature and Management of Health Care*. Boston, MA: Harvard Business Press.
- Boone, T. and Ganeshan, R., 2001. The effect of information technology on learning in professional service organizations. *Journal of Operations Management*, 19(4), pp. 485–495.
- Bowen, S. and Zwi, A. B., 2005. Pathways to “evidence-informed” policy and practice: A framework for action. *PLOS Medicine*, 2(7), pp. 0600–0605.
- Boyer, K. K., Gardner, J. W. and Schweikhart, S., 2012. Process quality improvement: An examination of general vs. outcome-specific climate and practices in hospitals. *Journal of Operations Management*, 30(4), pp. 325–339.
- Braithwaite, J., Iedema, R.A. and Jorm, C., 2007. Trust, communication, theory of mind and the social brain hypothesis: deep explanations for what goes wrong in health care. *Journal of Health Organization and Management*, 21(4/5), pp.353-367.
- Brand, C., Landgren, F., Hutchinson, A., Jones, C., Macgregor, L. and Campbell, D., 2005. Clinical practice guidelines: barriers to durability after effective early implementation. *Internal Medicine Journal*, 35(3), pp.162-169.
- Brandon, D. P. and Hollingshead, A. B. 2004. *Organization Science*, 15(6), pp. 633–644.
- Brehmer, B., 1976. Social judgment theory and the analysis of interpersonal conflict., *Psychological Bulletin*, 83(6), pp. 985–1003.
- Brennan, L. L., 2008. Understanding the Knowledge-Sharing Challenge: Is a “Bottleneck” Perspective the Answer?. *Academy of Management Perspectives*, 22(3), pp. 112–114.

- Bresnen, M., Hodgson, D., Bailey, S., Hyde, P. and Hassard, J., 2017. Mobilizing management knowledge in healthcare: Institutional imperatives and professional and organizational mediating effects. *Management Learning*, 00(0), pp.1-18.
- Brown, L., Tucker, C. and Domokos, T., 2003. Evaluating the impact of integrated health and social care teams on older people living in the community, *Health & Social Care in the Community*, 11(2), pp. 85–94.
- Bruns, H. C., 2009. Leveraging functionality in safety routines: Examining the divergence of rules and performance. *Human Relations*, 62(9), pp. 1399–1426.
- Bryman, A., 2008. Why do researchers integrate/combine/mesh/blend/mix/merge/fuse quantitative and qualitative research?. In M. Bergman (ed.). *Advances in mixed methods research: Theories and applications*. London: Sage, pp. 87-100.
- Buchanan, D., Fitzgerald, L., Ketley, D., Gollop, R., Jones, J.L., Lamont, S.S., Neath, A. and Whitby, E., 2005. No going back: A review of the literature on sustaining organizational change. *International Journal of Management Reviews*, 7(3), pp.189-205.
- Butler, T. W., Leong, G. K. and Everett, L. N., 1996. The operations management role in hospital strategic planning. *Journal of Operations Management*, 14(2), pp. 137–156.
- Buttell, P., Hendler, R. and Daley, J., 2008. Quality in healthcare: concepts and practice. In: H. Cohn Kenneth, E. Douglas Hough, *The Business of HealthCare*. Westport: Praeger, pp. 62–83.
- Cacciatori, E., 2012. Resolving Conflict in Problem-Solving: Systems of Artefacts in the Development of New Routines. *Journal of Management Studies*, 49(8), pp.1559-1585.
- Campbell, H., Hotchkiss, R., Bradshaw, N. and Porteous, M., 1998. Integrated care pathways. *BMJ: British Medical Journal*, 316(7125), pp.133-137.
- Carman, J.M., Shortell, S.M., Foster, R.W., Hughes, E.F., Boerstler, H., O'brien, J.L. and O'connor, E.J., 1996. Keys for successful implementation of total quality management in hospitals. *Healthcare Management Review*, 21(1), pp.48-60.
- Cassell, C. and Symon, G., 2004. *Essential guide to qualitative methods in organizational research*. London: Sage.
- Chakraborty, S., Bhattacharya, S. and Dobrzykowski, D.D., 2014. Impact of supply chain collaboration on value co-creation and firm performance: a healthcare service sector perspective. *Procedia Economics and Finance*, 11, pp.676-694.

- Chao, C.A., 2016. The impact of electronic health records on collaborative work routines: A narrative network analysis. *International Journal of Medical Informatics*, 94, pp.100-111.
- Chell, E., 1998. Critical Incident Technique. In: G., Symon and C., Catherine eds. *Qualitative Methods and Analysis in Organizational Research: A Practical Guide*, US: Sage, pp.51-72
- Chen, D.Q., Preston, D.S. and Xia, W., 2013. Enhancing hospital supply chain performance: A relational view and empirical test. *Journal of Operations Management*, 31(6), pp.391-408.
- Cheung, D.S., Kelly, J.J., Beach, C., Berkeley, R.P., Bitterman, R.A., Broida, R.I., Dalsey, W.C., Farley, H.L., Fuller, D.C., Garvey, D.J. and Klauer, K.M., 2010. Improving handoffs in the emergency department. *Annals of Emergency Medicine*, 55(2), pp.171-180.
- Chiarini, A., Waste savings in patient transportation inside large hospitals using lean thinking tools and logistic solutions. *Leadership in Health Services*, 26(4), pp. 456-367
- Cilliers, P. and Spurrett, D., 1998. Complexity and post-modernism: Understanding complex systems. *South African Journal of Philosophy*, 18(2), pp.258-274.
- Cohen, M.D. and Bacdayan, P., 1994. Organizational routines are stored as procedural memory: Evidence from a laboratory study. *Organization Science*, 5(4), pp.554-568.
- Cohendet, P. and Llerena, P., 2003. Routines and incentives: the role of communities in the firm. *Industrial and Corporate Change*, 12(2), pp. 271–297.
- Coiera, E.W., Jayasuriya, R.A., Hardy, J., Bannan, A. and Thorpe, M.E., 2002. Communication loads on clinical staff in the emergency department. *The Medical Journal of Australia*, 176(9), pp.415-418.
- Coleman, J. S., 1988. Social capital in the creation of human capital. *American Journal of Sociology*, 94(1), 95-120.
- Colligan, L., Anderson, J.E., Potts, H.W. and Berman, J., 2010. Does the process map influence the outcome of quality improvement work? A comparison of a sequential flow diagram and a hierarchical task analysis diagram. *BMC health services research*, 10(1), p.7-16.
- Colombo F., Llena-Nozal A., Mercier J., Tjadens F., 2011. *Help wanted? : providing and paying for long-term care*. Paris: OECD.
- Colvin, M.O., Eisen, L.A. and Gong, M.N., 2016, Improving the patient handoff process in the intensive care unit: Keys to reducing errors and improving outcomes. *Seminars in Respiratory and Critical Care Medicine*, 37(1), pp. 096-106).

- Constantinides, P. and Barrett, M., 2012. A narrative networks approach to understanding coordination practices in emergency response. *Information and Organization*, 22(4), pp. 273–294.
- Cottyn, J., Van Landeghem, H., Stockman, K. and Derammelaere, S., 2011. A method to align a manufacturing execution system with Lean objectives. *International Journal of Production Research*, 49(14), pp.4397-4413.
- Crocker, T., Johnson, O. and King, S., 2007. Towards a formalization of care pathways to embody good practice in healthcare. In *Proceedings of eGovernment Workshop, Metropolitan University, Leeds*.
- Crossan, M. M. and Apaydin, M., 2010. A multi-dimensional framework of organizational innovation: A systematic review of the literature. *Journal of Management Studies*, 47(6), pp. 1154–1191.
- Currie, G., Finn, R. and Martin, G., 2008. Accounting for the dark side of new organizational forms: The case of healthcare professionals. *Human Relations*, 61(4), pp.539-564.
- Curry, N., Harris, M., Gunn, L., Pappas, Y., Blunt, I., Soljak, M., Mastellos, N., Holder, H., Smith, J., Majeed, A. and Ignatowicz, A., 2013. Integrated care pilot in north west London: a mixed methods evaluation. *International Journal of Integrated Care*, 13(3), pp.37-52.
- Cyert, R.M. and March, J.G., 1963. *A behavioral theory of the firm* 2nd ed. Englewood Cliffs, NJ: Blackwell Business.
- D’Adderio, L., 2001. Crafting the virtual prototype: how firms integrate knowledge and capabilities across organisational boundaries. *Research Policy*, 30(9), pp. 1409–1424.
- D’Adderio, L., 2008. The performativity of routines: Theorising the influence of artefacts and distributed agencies on routines dynamics. *Research Policy*, 37(5), pp. 769–789.
- D’Adderio, L., 2011. Artifacts at the centre of routines: Performing the material turn in routines theory. *Journal of Institutional Economics*, 7(2), pp. 197–230.
- Dahlgaard, J. J., Pettersen, J. and Dahlgaard-Park, S. M., 2011. Quality and lean health care: A system for assessing and improving the health of healthcare organisations. *Total Quality Management & Business Excellence*, 22(6), pp. 673–689.
- Dahlgaard, J.J. and Mi Dahlgaard-Park, S., 2006. Lean production, six sigma quality, TQM and company culture. *The TQM magazine*, 18(3), pp.263-281.
- Damschroder, L.J., Aron, D.C., Keith, R.E., Kirsh, S.R., Alexander, J.A. and Lowery, J.C., 2009. Fostering implementation of health services research findings into practice: a

- consolidated framework for advancing implementation science. *Implementation Science*, 4(1), p.50.
- Dassisti, M., 2010. HY-CHANGE: a hybrid methodology for continuous performance improvement of manufacturing processes. *International Journal of Production Research*, 48(15), pp.4397-4422.
- Dayan, R., Heisig, P. and Matos, F., 2017. Knowledge management as a factor for the formulation and implementation of organization strategy. *Journal of Knowledge Management*, 21(2), pp.308-329.
- de Souza, L. B. and Pidd, M., 2011. Exploring the barriers to lean health care implementation. *Public Money & Management*, 31(1), pp. 59–66.
- DelliFraine, J. L., Langabeer, J. R. and Nembhard, I. M., 2010. Assessing the Evidence of Six Sigma and Lean in the Health Care Industry. *Quality Management in Healthcare*, 19(3), pp. 211–225.
- Den Hertog, P., 2000. Knowledge Intensive Business Services As Co-Producers of Innovation'. *International Journal of Innovation Management*, 4(4), pp. 4–6.
- Deneckere, S., Euwema, M., Van Herck, P., Lodewijckx, C., Panella, M., Sermeus, W. and Vanhaecht, K., 2012. Care pathways lead to better teamwork: Results of a systematic review. *Social Science & Medicine*, 75(2), pp.264-268.
- Deutsch, M., 1973. *The resolution of conflict: Constructive and Destructive Processes..* New Haven: Yale University Press.
- Dewar, B. and Mackay, R., 2010. Appreciating and developing compassionate care in an acute hospital setting caring for older people. *International Journal of Older People Nursing*, 5(4), pp.299-308.
- Dickson, P.R., Lassar, W.M., Hunter, G. and Chakravorti, S., 2009. The pursuit of excellence in process thinking and customer relationship management. *Journal of Personal Selling & Sales Management*, 29(2), pp.111-124.
- Dionne S. Kringos, Sunol, R., Wagner, C., Mannion, R., Michel, P., Klazinga, N.S. and Groene, O., 2015. The influence of context on the effectiveness of hospital quality improvement strategies: a review of systematic reviews. *BMC health services research*. 15(1), pp.277-290.
- Dittrich, K., Guérard, S. and Seidl, D., 2016. Talking about routines: The role of reflective talk in routine change. *Organization Science*, 27(3), pp.678-697.

- Dobrzykowski, D. D. and Tarafdar, M., 2015. Understanding information exchange in healthcare operations: Evidence from hospitals and patients. *Journal of Operations Management*, 36, pp. 201–214.
- Dobrzykowski, D., Deilami, V.S., Hong, P. and Kim, S.C., 2014. A structured analysis of operations and supply chain management research in healthcare (1982–2011). *International Journal of Production Economics*, 147, pp.514-530.
- Dobrzykowski, D.D., McFadden, K.L. and Vonderembse, M.A., 2016. Examining pathways to safety and financial performance in hospitals: A study of lean in professional service operations. *Journal of Operations Management*, 42, pp.39-51.
- Dodd, C.H., 1991. *Dynamics of intercultural communication*. 6th ed. US: WC Brown.
- Douglas, T. J. and Fredendall, L. D., 2004. Evaluating the deming management model of total quality in services. *Decision Sciences*, 35(3), pp. 393–419.
- Drupsteen, J., van der Vaart, T. and Van Donk, D. P., 2016. Operational antecedents of integrated patient planning in hospitals. *International Journal of Operations & Production Management*, 36(8), pp. 879–900.
- Dubois, A. and Gadde, L.E., 2002. Systematic combining: an abductive approach to case research. *Journal of Business Research*, 55(7), pp.553-560.
- Easterby-Smith, M.T., Thorpe, R., and Lowe, A. 2002. *Management research: An introductio*, 2nd Edition, London: Sage
- Eccles, M., Grimshaw, J., Walker, A., Johnston, M. and Pitts, N., 2005. Changing the behavior of healthcare professionals: the use of theory in promoting the uptake of research findings. *Journal of Clinical Epidemiology*, 58(2), pp.107-112.
- Edmondson, A.C., Bohmer, R.M. and Pisano, G.P., 2001. Disrupted routines: Team learning and new technology implementation in hospitals. *Administrative Science Quarterly*, 46(4), pp.685-716.
- Elissen, A. M. J., Van Raak, A. J. A. and Paulus, A. T. G., 2011. Can we make sense of multidisciplinary co-operation in primary care by considering routines and rules?. *Health & Social Care in the Community*, 19(1), pp. 33–42.
- Engeström, Y. and Sannino, A., 2010. Studies of expansive learning: Foundations, findings and future challenges. *Educational research review*, 5(1), pp.1-24.
- Engeström, Y., 2001. Expansive learning at work: Toward an activity theoretical reconceptualization. *Journal of education and work*, 14(1), pp.133-156.

- Essén, A., 2008. Variability as a source of stability: Studying routines in the elderly home care setting. *Human Relations*, 61(11), pp. 1617–1644.
- Feldman, M. S. and Orlikowski, W. J., 2011. Theorizing practice and practicing theory. *Organization Science*, 22(5), pp. 1240–1253.
- Feldman, M. S. and Pentland, B. T., 2003. Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly*, 48(1), pp. 94–118.
- Feldman, M. S. and Rafaeli, A., 2002. Organizational routines as sources of connections and understandings. *Journal of Management Studies*, 39(3), pp. 309–331.
- Feldman, M. S., 2000. Organizational routines as a source of continuous change. *Organization Science*, 11(6), pp. 611–629.
- Feldman, M.S., 2004. Resources in emerging structures and processes of change. *Organization Science*, 15(3), pp.295-309.
- Feldman, M.S., Pentland, B.T., D’Adderio, L. and Lazaric, N., 2016. Beyond routines as things: Introduction to the special issue on routine dynamics. *Organization Science*, 27(3), pp. 505–513.
- Felício, J. A., Gonçalves, H. M. and da Conceição Gonçalves, V., 2013. Social value and organizational performance in non-profit social organizations: Social entrepreneurship, leadership, and socioeconomic context effect. *Journal of Business Research*, 66(10), pp. 2139–2146.
- Felin, T. and Foss, N. J., 2009. Organizational routines and capabilities: Historical drift and a course-correction toward microfoundations, *Scandinavian Journal of Management*, 25(2), pp. 157–167.
- Felin, T., Foss, N.J., Heimeriks, K.H. and Madsen, T.L., 2012. Microfoundations of routines and capabilities: Individuals, processes, and structure. *Journal of Management Studies*, 49(8), pp.1351-1374.
- Field, J.M. and Sinha, K.K., 2005. Applying process knowledge for yield variation reduction: A longitudinal field study. *Decision Sciences*, 36(1), pp.159-186.
- Fillingham, D., 2007. Can lean save lives?. *Leadership in Health Services*, 20(4), pp. 231–241.
- Finegold, J. A., Asaria, P. and Francis, D. P., 2013. Mortality from ischaemic heart disease by country, region, and age: Statistics from World Health Organisation and United Nations, *International Journal of Cardiology*, 168(2), pp. 934–945.

- Firestone, W.A., 1987. Meaning in method: The rhetoric of quantitative and qualitative research. *Educational Researcher*, 16(7), pp.16-21.
- Fitzgerald, P.J., 2007. Adjust Your Brain: A Practical Theory for Maximizing Mental Health. *Journal of Loss and Trauma*, 13(5), pp.466-470.
- Flyvbjerg, B., 2011. Case Study. In: K., Norman, S., and. S. Lincoln, eds. *Handbook of Qualitative Research*, 4th Edition. US: Sage, pp. 301-316.
- Folscher, L.L., Goldstein, L.N., Wells, M. and Rees, D., 2015. Emergency department noise: mental activation or mental stress?, *Emergency Medicine Journal*, 32(6), pp. 468–473.
- Foundation, 2013, *Quality Improvement made Simple*, UK: Health Foundation.
- Freedman, N. S., Kotzer, N. and Schwab, R. J., 1999. Patient perception of sleep quality and etiology of sleep disruption in the intensive care unit. *American Journal of Respiratory and Critical Care Medicine*, 159(4), pp. 1155–62.
- Fu, N., 2015. The role of relational resources in the knowledge management capability and innovation of professional service firms. *Human relations*, 68(5), pp.731-764.
- Gache, K., Leleu, H., Nitenberg, G., Woimant, F., Ferrua, M. and Minvielle, E., 2014. Main barriers to effective implementation of stroke care pathways in France: a qualitative study. *BMC Health Services Research*, 14(1), pp.95-104.
- Gage, N. L., 1989. The paradigm wars and their aftermath a “historical” sketch of research on teaching since 1989. *Educational Researcher*, 18(7), pp. 4–10.
- Gannon-Leary, P., Baines, S. and Wilson, R., 2006. Collaboration and partnership: A review and reflections on a national project to join up local services in England. *Journal of Interprofessional Care*, 20(6), pp. 665–674.
- Gao, D., Deng, X. and Bai, B., 2014. The emergence of organizational routines from habitual behaviours of multiple actors: an agent-based simulation study. *Journal of Simulation*, 8(3), pp.215-230.
- Geiger, D. and Schröder, A., 2014. Ever-changing routines? Toward a revised understanding of organizational routines between rule-following and rule-breaking. *Schmalenbach Business Review*, 66(2), p.170.
- Gerein, N., Green, A. and Pearson, S., 2006. The Implications of Shortages of Health Professionals for Maternal Health in Sub-Saharan Africa. *Reproductive Health Matters*, 14(27), pp. 40–50.

- Gersick, C. J. G. and Hackman, J. R., 1990. Habitual routines in task-performing groups. *Organizational Behavior and Human Decision Processes*, 47(1), pp. 65–97.
- Giddens, A., 1984. *The constitution of society: Outline of the theory of structuration*. Berkeley: Univ of California Press.
- Gil Nunez, A. C. and Mora, J.V., 2004. Organization of medical care in acute stroke: importance of a good network. *Cerebrovascular Diseases*, 17(1), pp.113-123.
- Gitlin, L. N., Lyons, K. J. and Kolodner, E. 1994. A model to build collaborative research or educational teams of health professionals in gerontology. *Cerebrovascular Educational Gerontology: An International Quarterly*, 20(1), pp. 15–34.
- Gittell, J. H. 2011. *Relational coordination: Guidelines for theory, measurement and analysis*. Waltham, MA: Brandeis University.
- Gittell, J.H., Fairfield, K.M., Bierbaum, B., Head, W., Jackson, R., Kelly, M., Laskin, R., Lipson, S., Siliski, J., Thornhill, T. and Zuckerman, J., 2000. Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: a nine-hospital study of surgical patients. *Medical Care*, 38(8), pp.807-819.
- Glasgow, J. M., Scott-Caziewell, J. R. and Kaboli, P. J. 2010. Guiding inpatient quality improvement: a systematic review of Lean and Six Sigma. *Joint Commission Journal on Quality and Patient Safety*, 36(12), pp. 533–40.
- Goh, J. M., Gao, G. and Agarwal, R. 2011. Evolving work routines: adaptive routinization of information technology in healthcare. *Information Systems Research*, 22(3), pp. 565–585.
- Gonçalves, P. D., Hagenbeek, M. L. and Vissers, J. M. H. 2013. Hospital process orientation from an operations management perspective: development of a measurement tool and practical testing in three ophthalmic practices. *BMC Health Services Research*, 13(1), pp. 475-489.
- Goodale, J. C., Kuratko, D. F. and Hornsby, J. S., 2008. Influence factors for operational control and compensation in professional service firms. *Journal of Operations Management*, 26(5), pp. 669–688.
- Gowen, C. R., McFadden, K. L. and Settaluri, S., 2012. Contrasting continuous quality improvement, Six Sigma, and lean management for enhanced outcomes in US hospitals. *American Journal of Business*, 27(2), pp. 133–153.
- Greenhalgh, T., 2008. Role of routines in collaborative work in healthcare organisations. *BMJ: British Medical Journal (Online)*, 337(7681), pp.1269-1271.

- Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P. and Kyriakidou, O., 2004. Diffusion of innovations in service organizations: systematic review and recommendations. *The Milbank Quarterly*, 82(4), pp.581-629.
- Greenhalgh, T., Russell, J. and Swinglehurst, D., 2005. Narrative methods in quality improvement research', *Quality and Safety in Health Care*, 14(6), pp. 443–449.
- Greenhalgh, T., Stramer, K., Bratan, T., Byrne, E., Mohammad, Y. and Russell, J., 2008. Introduction of shared electronic records: multi-site case study using diffusion of innovation theory. *BMJ: British Medical Journal*, 337, pp. 1786-1796.
- Greenhalgh, T., Voisey, C. and Robb, N., 2007. Interpreted consultations as “business as usual”? An analysis of organisational routines in general practices. *Sociology of Health & Illness*, 29(6), pp. 931–954.
- Greeno, J.G., 1997. On claims that answer the wrong questions. *Educational researcher*, 26(1), pp.5-17.
- Griffiths, P., Renz, A., Hughes, J. and Rafferty, A.M., 2009. Impact of organisation and management factors on infection control in hospitals: a scoping review. *Journal of Hospital Infection*, 73(1), pp.1-14.
- Grimshaw, J., McAuley, L.M., Bero, L.A., Grilli, R., Oxman, A.D., Ramsay, C., Vale, L. and Zwarenstein, M., 2003. Systematic reviews of the effectiveness of quality improvement strategies and programmes. *BMJ Quality & Safety*, 12(4), pp.298-303.
- Grimshaw, J.M., Thomas, R.E., MacLennan, G., Fraser, C., Ramsay, C.R., Vale, L., Whitty, P., Eccles, M.P., Matowe, L., Shirran, L. and Wensing, M., 2004. Effectiveness and efficiency of guideline dissemination and implementation strategies. *International Journal of Technology Assessment in Health Care*, 21(1), pp.149-149.
- Grove, A.L., Meredith, J.O., Macintyre, M., Angelis, J. and Neailey, K., 2010. UK health visiting: challenges faced during lean implementation. *Leadership in Health Services*, 23(3), pp.204-218.
- Guba, E. G. 1990, *The paradigm dialog*. US: Sage.
- Gurses, A. P. and Carayon, P., 2007. Performance obstacles of intensive care nurses. *Nursing Research*, 56(3), pp. 185–194.
- Habib, J. and Krohmer, C., 2016. Balanced or unbalanced routines: the case of two routines dynamics in a French hospital', *Journal of Organizational Change Management* 29(4), pp. 508–528.

- Hackman, J.R. and Wageman, R., 1995. Total quality management: Empirical, conceptual, and practical issues. *Administrative Science Quarterly*, 40(2), pp.309-342.
- Hanks, W., Forward to Lave and Wenger, 1991. In: C., Kimble, P., Hildreth, I., Bourdon eds. *Communities of Practice: Creating Learning Environments for Educators*. Cambridge: Cambridge University Press.
- Haque, S.N., 2010. When routines are not so routine: Exploring coordination work in hospitals. Thesis (M.A.), Syracuse University, Syracuse, New York, United States.
- Harvey D., 1990. *The condition of postmodernity: an enquiry into the origins of cultural change*. Oxford: Blackwell
- Harvey, J., Heineke, J. and Lewis, M., 2016. ‘Editorial for Journal of Operations Management special issue on “Professional Service Operations Management (PSOM)”’. *Journal of operations management*, 42–43, pp. 4–8.
- Hayes, G. R., Lee, C. P. and Dourish, P., 2011. Organizational routines, innovation, and flexibility: The application of narrative networks to dynamic workflow. *International Journal of Medical Informatics*, 80(8), pp. e161–e177.
- Hellström, A., Lifvergren, S. and Quist, J., 2009. Applying process management in healthcare—investigating implementation difficulties. *Proceedings of the 16th annual international EurOMA conference*. June 14-17, 2009. Sweden: Chalmers University of Technology Goteborg, pp. 1-10.
- Hellström, A., Lifvergren, S. and Quist, J., 2010 (a). Process management in healthcare: investigating why it’s easier said than done. *Journal of Manufacturing Technology Management*, 21(4), pp. 499–511.
- Hellström, E., Åslund, J. and Nielsen, L., 2010 (b). Horizon Length and Fuel Equivalents for Fuel-optimal Look-ahead Control. *IFAC Proceedings Volumes*. 43(7), pp. 360–365.
- Hempel, P.S., Zhang, Z.-X. and Han, Y. 2012, Team empowerment and the organizational context: decentralization and the contrasting effects of formalization, *Journal of Management*, 38 (2), pp. 475-501
- Heskett, J.L., Sasser, W.E. and Schlesinger, L.A., 2010. The Service Profit Chain. In: P. Maglio, C. Kieliszewski, J. Spohrer, eds. *Handbook of Services Marketing and Management*. Boston, MA: Springer US, pp.19-29.

- Hilligoss, B. and Cohen, M. D., 2011. Hospital handoffs as multifunctional situated routines: implications for researchers and administrators. *Advances in Health Care Management*, 11, pp. 91–132.
- Hirschheim, R., Klein, H.K. and Lyytinen, K., 1995. *Information systems development and data modeling: conceptual and philosophical foundations*. Cambridge University Press.
- Hirsh, I. J. and Watson, C. S., 1996. Auditory psychophysics and perception. *Annual Review of Psychology*, 47(1), pp. 461–484.
- Hoffer Gittell, J., 2002. Coordinating mechanisms in care provider groups: Relational coordination as a mediator and input uncertainty as a moderator of performance effects. *Management Science*, 48(11), pp. 1408–1426.
- Hoot, N.R., LeBlanc, L.J., Jones, I., Levin, S.R., Zhou, C., Gadd, C.S. and Aronsky, D., 2008. Forecasting emergency department crowding: a discrete event simulation. *Annals of Emergency Medicine*, 52(2), pp.116-125.
- Hopkinson, S. G. and Jennings, B. M., 2013. Interruptions during nurses' work: A state-of-the-science review. *Research in Nursing & Health*, 36(1), pp. 38–53.
- Hounshell, D., 1985. *From the American system to mass production, 1800-1932: The development of manufacturing technology in the United States*. 4th edition, London: JHU Press.
- Hughes, R. G., 2008. *Tools and Strategies for Quality Improvement and Patient Safety*, Ronda G. H. ed., *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Rockville: Agency for Healthcare Research and Quality
- Hurwitz, B., Greenhalgh, T. and Skultans, V., 2004. *Narrative Research in Health and Illness* [Online], Oxford: Blackwell Publishing, Available from: <http://doi.wiley.com/10.1111/j.1467-566.1997.tb00015.x> [Accessed 17 January 2017].
- Huy, Q.R., Bagozzi, W., Boss, F. and Sguera, F., 2010. Affective enablers of knowledge sharing in a high performance hospital, working paper, University of Michigan, Ann Harbor, MN.
- Ibrahim, M. and Ribbers, P. M., 2009. The impacts of competence-trust and openness-trust on interorganizational systems. *European Journal of Information Systems*, 18(3), pp. 223–234.
- Ignatavicius, D.D. and Hausman, K.A., 1995. *Clinical pathways for collaborative practice*. Philadelphia (PA): WB Saunders Company.

Innis, J. and Berta, W., 2016. Routines for change: how managers can use absorptive capacity to adopt and implement evidence-based practice. *Journal of Nursing Management*, 24(6), pp.718-724.

Institute of Medicine. 1999. *To err is human: building a safer health system*. Washington (DC): National Academy Press

Irajpour, A. and Alavi, M., 2015. Health professionals' experiences and perceptions of challenges of interprofessional collaboration: Socio-cultural influences of IPC. *Iranian Journal of Nursing and Midwifery Research*, 20(1), pp. 99-104.

Jack, E. P. and Raturi, A. S., 2006, Lessons learned from methodological triangulation in management research. *Management Research News*, 29(6), pp. 345–357.

Jick, Todd D., 1979. Mixing qualitative and quantitative methods: Triangulation in action. *Administrative science quarterly*, 24(4), pp. 602-611.

Johnson, R. B. and Onwuegbuzie, A. J., 2004, Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), pp. 14–26.

Johnston, R., 2005. Service operations management: from the roots up. *International Journal of Operations & Production Management*, 25(12), pp. 1298–1308.

Joosten, T., Bongers, I. and Janssen, R., 2009. Application of lean thinking to health care: issues and observations. *International Journal for Quality in Health Care*, 21(5), pp. 341–347.

Juan, Y.-C. and Ou-Yang, C., 2004. Systematic approach for the gap analysis of business processes. *International Journal of Production Research*, 42(7), pp. 1325–1364.

Jun, G.T., Ward, J., Morris, Z. and Clarkson, J., 2009. Health care process modelling: which method when?. *International Journal for Quality in Health Care*, 21(3), pp.214-224.

Kaplan, H.C., Brady, P.W., Dritz, M.C., Hooper, D.K., Linam, W., Froehle, C.M. and Margolis, P., 2010. The influence of context on quality improvement success in health care: a systematic review of the literature. *The Milbank Quarterly*, 88(4), pp.500-559.

Kaplan, H.C., Provost, L.P., Froehle, C.M. and Margolis, P.A., 2011. The Model for Understanding Success in Quality (MUSIQ): building a theory of context in healthcare quality improvement. *Quality and Safety in Health Care*, 21(1), pp.13-20.

Kaplan, R. S. and Norton, D. P., 1992. 'The Balanced Scorecard - Measures That Drive Performance. *Harvard Business Review*, 70(1), pp. 71–79.

- Käppeli, S., 1995. Interprofessional cooperation: why is partnership so difficult?. *Patient Education and Counseling*, 26(1–3), pp. 251–256.
- Kaye, P., Shaw, L., Madigan, B. and Jakeman, N., 2011. Emergency department-focused thrombolysis for acute ischaemic stroke. *Emergency Medicine Journal*, 28(2), pp.102-106.
- Kenny, R., Johnston, C. and Qureshi, I., 2014. Improving surgical inpatient ward lists in a large acute hospital: a simple yet effective process to save the time of junior house officers. *BMJ Quality Improvement Reports*, 3(1), pp. u203341-w1798.
- Khun, S.T. 1970. *The Structure of Scientific Revolution*, (2nd edn), Chicago: University of Chicago Press.
- Kim, C.S., Spahlinger, D.A., Kin, J.M. and Billi, J.E., 2006. Lean health care: what can hospitals learn from a world-class automaker?. *Journal of Hospital Medicine*, 1(3), pp.191-199.
- Klein, K. J. and Sorra, J. S., 1996. The challenge of innovation implementation. *Academy of Management Review*, 21(4), pp. 1055–1080
- Klein, R., 2007. The new model NHS: performance, perceptions and expectations. *British Medical Bulletin*, 81(82), pp. 39–50.
- Kogut, B. and Zander, U., 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, 3(3), pp. 383-397.
- Kraut, R.E., Fussell, S.R., Brennan, S.E. and Siegel, J., 2002. Understanding effects of proximity on collaboration: Implications for technologies to support remote collaborative work. *Distributed work*, pp.137-162.
- Kuhn, T. 1970. *The Structure of Scientific Revolutions*. Chicago University Press, Chicago, IL.
- Kuhn, T., 1970. S. 1962. *The structure of scientific revolutions*. US: University of Chicago Press
- Kumar, A., 2007. From mass customization to mass personalization: A strategic transformation. *International Journal of Flexible Manufacturing Systems*, 19(4), pp. 533–547.
- Kwan, K.-M. and Tsang, E. W. K., 2001. Realism and constructivism in strategy research: a critical realist response to Mir and Watson. *Strategic Management Journal*, 22(12), pp. 1163–1168.

- Latour, B., 2005. *Reassembling the social: An introduction to actor-network-theory*, Oxford: Oxford University Press.
- Latour, B., 2008. A cautious Prometheus? A few steps toward a philosophy of design (with special attention to Peter Sloterdijk). In J. Glynne, F. Hackney, & V. Minton (Eds.). pp. 2-10. Networks of design (pp. 2–10). Boca Raton: BrownWalker Press.
- Lazaric, N., 2008. Routines and routinization: an exploration of some micro-cognitive foundations. In: M. C. Becker ed., *Handbook of Organizational Routines*. Cheltenham: Edward Elgar, pp.205–27.
- Leape, L., Berwick, D., Clancy, C., Conway, J., Gluck, P., Guest, J., Lawrence, D., Morath, J., O’Leary, D., O’Neill, P. and Pinakiewicz, D., 2009. Transforming healthcare: a safety imperative. *Quality and Safety in Health Care*, 18(6), pp.424-428.
- LeBaron, C., Christianson, M.K., Garrett, L. and Ilan, R., 2016. Coordinating flexible performance during everyday work: An ethnomethodological study of handoff routines. *Organization Science*, 27(3), pp.514-534.
- Lee, D. Y.,1997. The Impact of Poor Performance on Risk-Taking Attitudes: A Longitudinal Study with a PLS Causal Modeling Approach’, *Decision Sciences*, 28(I), pp. 59–80.
- Lee, J. G. and Clarke, R. W., 1992. Restructuring Improves Hospital Competitiveness. *Healthcare Financial Management*, 46(11), pp. 30-37.
- Légaré, F., Stacey, D., Gagnon, S., Dunn, S., Pluye, P., Frosch, D., Kryworuchko, J., Elwyn, G., Gagnon, M.P. and Graham, I.D., 2011. Validating a conceptual model for an inter-professional approach to shared decision making: a mixed methods study. *Journal of Evaluation in Clinical Practice*, 17(4), pp.554-564.
- Lettieri, E., Shani, A. Longoni, A., Cagliano, R., Masella, C., Molteni, F., 2012. Can Technology Enable Sustainable Effectiveness in Health Care Delivery? Some Lessons from a Rehabilitation Hospital. In Susan A.M., Abraham, B.R.S. (eds.) *Organizing for Sustainable Health Care (Organizing for Sustainable Effectiveness*, 2nd ed, Bingley, United Kingdom: Emerald Group Publishing Limited, pp.113 - 146
- Levac, D., Colquhoun, H. and O'Brien, K.K., 2010. Scoping studies: advancing the methodology. *Implementation Science*, 5(1), pp.69-78.
- Levitt, B. and March, J.G., 1988. Organizational learning. *Annual Review of Sociology*, 14(1), pp.319-338.

- Lewis, M. A. and Brown, A. D., 2012. How different is professional service operations management?. *Journal of Operations Management*, 30(1–2), pp. 1–11.
- Lewis, M. A., 2000. Lean production and sustainable competitive advantage', *International Journal of Operations & Production Management*, 20(8), pp. 959–978.
- Lifvergren, S., Gremyr, I., Hellström, A., Chakhunashvili, A. and Bergman, B., 2010. Lessons from Sweden's first large-scale implementation of Six Sigma in healthcare. *Operations Management Research*, 3(3-4), pp.117-128.
- Lillrank, P. and Liukko, M., 2004. Standard, routine and non-routine processes in health care.', *International journal of health care quality assurance incorporating. Leadership in Health Services*, 17(1), pp. 39–46.
- Liman Mansar, S. and Reijers, H. A., 2007. Best practices in business process redesign: use and impact. *Business Process Management Journal*, 13(2), pp. 193–213.
- Löfgren, S., Hansson, J., Øvretveit, J. and Brommels, M., 2012. Context challenges the champion: improving hip fracture care in a Swedish university hospital. *International Journal of Health Care Quality Assurance*, 25(2), pp.118-133.
- Löfgren, S., Hansson, J., Øvretveit, J. and Brommels, M., 2012. Context challenges the champion: improving hip fracture care in a Swedish university hospital. *International journal of health care quality assurance*, 25(2), pp.118-133.
- Mackenzie, K. D. and House, R., 1978. 'Paradigm Development in the Social Sciences: A Proposed Research Strategy. *Academy of Management Review*, 3(1), pp. 7–23
- Maddern, H., Smart, P.A., Maull, R.S. and Childe, S., 2014. End-to-end process management: implications for theory and practice. *Production Planning & Control*, 25(16), pp.1303-1321.
- Madison, D., 2005. *Process mapping, process improvement, and process management: a practical guide for enhancing work and information flow*. CA, USA: Paton Professional.
- Malone, T. W. and Crowston, K., 1994. The interdisciplinary study of coordination. *ACM Computing Surveys*, 26(1), pp. 87–119.
- Malone, T.W., Crowston, K., Lee, J., Pentland, B., Dellarocas, C., Wyner, G., Quimby, J., Osborn, C.S., Bernstein, A., Herman, G. and Klein, M., 1999. Tools for inventing organizations: Toward a handbook of organizational processes. *Management Science*, 45(3), pp.425-443.
- Mann, L. ,2005. From 'silos' to seamless health care: bringing hospitals and GPs back

together again. *Medical Journal of Australia*, 182, pp. 34–37.

Mariano, S. and Awazu, Y., 2017. ‘The role of collaborative knowledge building in the co-creation of artifacts: influencing factors and propositions’, *Journal of Knowledge Management*, 21(4), pp. 779–795.

Marshall, M. N., 1996. Sampling for qualitative research. *Family Practice*, 13(6), pp. 522–526.

Matthews, M. R., 2002. Constructivism and science education: A further appraisal. *Journal of Science Education and Technology*, 11(2), pp. 121–134.

Mauil, R. S., S. J. Childe, and A. M. Weaver. 1995. Different Types of Manufacturing Processes and IDEF0 Models Describing Standard Business Processes. Working Paper. Plymouth: University of Plymouth

Maxcy, S. J., 2003. Pragmatic threads in mixed methods research in the social sciences: The search for multiple modes of inquiry and the end of the philosophy of formalism, *Handbook of mixed methods in social and behavioral research*, pp. 51–89.

Mayer, R. C., Davis, J. H. and Schoorman, F. D., 1995. An integrative model of organizational trust. *Academy of Management Review*, 20(3), pp. 709–734.

McDermott, C. and Stock, G. N., 2007. Hospital operations and length of stay performance, *International Journal of Operations & Production Management*, 27(9), pp. 1020–1042.

McDonald, K. M., Sundaram, V., Bravata, D. M., Lewis, R., Lin, N., Kraft, S. A., McKinnon, M., Paguntalan, H. and Owens, D. K., 2007. University of California, US: Agency for Healthcare Research and Quality

McFadden, K. L., Stock, G. N. and Gowen, C. R., 2015. Leadership, safety climate, and continuous quality improvement. *Health Care Management Review*, 40(1), pp. 24–34.

McKnight, L.K., Stetson, P.D., Bakken, S., Curran, C. and Cimino, J.J., 2002. Perceived information needs and communication difficulties of inpatient physicians and nurses. *Journal of the American Medical Informatics Association*, 9(6), pp. S64-S69.

McNabb, D. E., 2010. *Case research in public management*. Abingdo, UK: Routledge.

McNally MK, Page MA, Sunderland VB. Failure mode and effects analysis in improving a drug distribution system. *Am J Health Syst Pharm*. 1997;54:17–7.

Mertens, D. M., 2003. Mixed Methods and the Politics of Human Research. In: Clark, V. P., and Creswell, J.W eds. *The Mixed Methods Reader*. US: Sage, pp.74-99.

- Miller, K. D., Choi, S. and Pentland, B. T., 2014. The role of transactive memory in the formation of organizational routines. *Strategic Organization*, 12(2), pp. 109–133.
- Miller, K. D., Pentland, B. T. and Choi, S., 2012. Dynamics of performing and remembering organizational routines. *Journal of Management Studies*, 49(8), pp. 1536–1558.
- Miller, M. J., Ferrin, D. M. and Szymanski, J. M., 2003. Simulating six sigma improvement ideas for a hospital emergency department. Chick S ed. *Proceedings of the 35th conference on Winter simulation: driving innovation*. December 07 - 10, 2003, Fairmont Hotel, New Orleans, LA. U.S.A: Association for Computing Machinery, pp. 1926–1929.
- Mingers, J. and Brocklesby, J., 1997. Multimethodology: towards a framework for mixing methodologies. *Omega*, 25(5), pp.489-509.
- Mingers, J., 2001. Combining IS Research Methods: Towards a Pluralist Methodology. *Information Systems Research*, 12(3), pp. 240–259.
- Morgan, D. L., 2007. Paradigms lost, and pragmatism regained methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research*, 1(1), pp. 48–76.
- Mouly, G. J., 1978. *Educational research: the art and science of investigation*. Boston: Allyn and Bacon
- Mura, M., Lettieri, E., Radaelli, G., Spiller, N. and Spiller, N., 2016. Behavioural operations in healthcare: a knowledge sharing perspective. *International Journal of Operations & Production Management*, 36(10), pp.1222-1246.
- Myers, R.P., Kaplan, G.G. and Shaheen, A.A.M., 2009. The effect of weekend versus weekday admission on outcomes of esophageal variceal hemorrhage. *Canadian Journal of Gastroenterology and Hepatology*, 23(7), pp.495-501.
- Myny, D., Van Hecke, A., De Bacquer, D., Verhaeghe, S., Gobert, M., Defloor, T. and Van Goubergen, D., 2012. Determining a set of measurable and relevant factors affecting nursing workload in the acute care hospital setting: a cross-sectional study. *International Journal of Nursing Studies*, 49(4), pp.427-436.
- Nahapiet, J. and Ghoshal, S., 1998. Social Capital, Intellectual Capital and the Organizational Advantage. *The Academy of Management Review*, 23(2), pp. 242–266.
- Neely, A.D., Adams, C. and Kennerley, M., 2002. *The performance prism: The scorecard for measuring and managing business success*. London: Financial Times/Prentice Hall.

- Nembhard, I.M., Alexander, J.A., Hoff, T.J. and Ramanujam, R., 2009. Why does the quality of health care continue to lag? Insights from management research. *The Academy of Management Perspectives*, 23(1), pp.24-42.
- Nemeth C, O'Connor M, Klock P, Cook R. 2006. Discovering healthcare cognition: The use of cognitive artifacts to reveal cognitive work. *Organization Studies*, 27, pp. 1011-1035.
- Nicolini, D., Mengis, J. and Swan, J., 2012. Understanding the role of objects in cross-disciplinary collaboration. *Organization science*, 23(3), pp.612-629.
- Noon, C.E., Hankins, C.T., Cote, M.J. and Lieb, M., 2003. Understanding the impact of variation in the delivery of healthcare services/practitioner application. *Journal of Healthcare Management*, 48(2), pp.82-97.
- Noon, M., Healy, G., Forson, C. and Oikelome, F., 2013. The Equality Effects of the 'Hyper-formalization' of Selection. *British Journal of Management*, 24(3), pp.333-346.
- Novak, L., Brooks, J., Gadd, C., Anders, S. and Lorenzi, N., 2012. Mediating the intersections of organizational routines during the introduction of a health IT system. *European Journal of Information Systems*, 21(5), pp.552-569.
- Novak, L.L., 2012. Finding hidden sources of new work from BCMA implementation: the value of an organizational routines perspective. *AMIA Annual Symposium Proceedings*, 2012, pp. 673-680.
- Ogbu, U.C., Westert, G.P., Slobbe, L.C., Stronks, K. and Arah, O.A., 2011. A multifaceted look at time of admission and its impact on case-fatality among a cohort of ischaemic stroke patients. *Journal of Neurology, Neurosurgery, and Psychiatry*, 82(1), pp. 8–13.
- Olsen, T. S., Möller, A., Blomstrand, C., Ueda, T., Mizushige, K., Yukiiri, K., Takahashi, T., Kohno, M., Kuo, T.B., Chern, C.M. and Yang, C.C., 2003. European stroke initiative recommendations for stroke management—update 2003. *Cerebrovascular Diseases*, 16(4), pp.311-337.
- Orlikowski, W. J., 2007. Sociomaterial practices: Exploring technology at work. *Organization Studies*, 28(9), pp. 1435–1448.
- Osidach, V. Z. and Fu, M. C., 2003. Public health: computer simulation of a mobile examination center., in *Proceedings of the 35th conference on Winter simulation: driving innovation*. Winter Simulation Conference, pp. 1868–1875.

- Øvretveit, J., 1997. How to describe interprofessional working. In: J. Øvretveit eds. *Interprofessional working for health and social care*. London: Macmillan Education UK, pp. 9-33
- Øvretveit, J., Scott, T., Rundall, T.G., Shortell, S.M. and Brommels, M., 2007. Improving quality through effective implementation of information technology in healthcare. *International Journal for Quality in Health Care*, 19(5), pp.259-266.
- Pagell, M., Klassen, R., Johnston, D., Shevchenko, A. and Sharma, S., 2015. Are safety and operational effectiveness contradictory requirements: The roles of routines and relational coordination. *Journal of Operations Management*, 36, pp.1-14.
- Papadopoulos, T., Radnor, Z. and Merali, Y., 2011. The role of actor associations in understanding the implementation of Lean thinking in healthcare. *International Journal of Operations & Production Management*. Emerald Group Publishing Limited, 31(2), pp. 167–191.
- Parker, J. and Coiera, E., 2000. Improving clinical communication. *Journal of the American Medical Informatics Association*, 7(5), pp. 453–461.
- Parmigiani, A. and Howard-Grenville, J., 2011. Routines revisited: Exploring the capabilities and practice perspectives. *The Academy of Management Annals*, 5(1), pp. 413–453.
- Party, I. S. W., 2012. *National clinical guideline for stroke*. London: Royal College of Physicians.
- Patel, V. L., Arocha, J. F. and Kaufman, D. R., 2001. A primer on aspects of cognition for medical informatics, *Journal of the American Medical Informatics Association*, 8(4), pp. 324–343.
- Patterson, S.M., Hughes, C., Kerse, N., Cardwell, C.R. and Bradley, M.C., 2012. Interventions to improve the appropriate use of polypharmacy for older people. *Cochrane Database Syst Rev*. [Online], Chichester, UK: John Wiley & Sons, Ltd. Available from: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD008165.pub2/full#pdf-section>.
- Pearson, S.D., Goulart-Fisher, D. and Lee, T.H., 1995. Critical Pathways as a Strategy for Improving Care: Problems and Potential. *Annals of Internal Medicine*. 123(12), pp.941-948
- Peltokorpi, A., 2011. How do strategic decisions and operative practices affect operating room productivity?. *Health Care Management Science*, 14(4), pp. 370–382.

- Peltokorpi, A., Linna, M., Malmström, T., Torkki, P. and Lillrank, P.M., 2016. Five focus strategies to organize health care delivery. *International Journal of Health Care Quality Assurance*, 29(2), pp.177-191.
- Pentland, B. T. and Feldman, M. S., 2005. Organizational routines as a unit of analysis. *Industrial and Corporate Change*, 14(5), pp. 793–815.
- Pentland, B. T. and Feldman, M. S., 2008. Designing routines: On the folly of designing artefacts, while hoping for patterns of action. *Information and Organization*, 18(4), pp. 235–250.
- Pentland, B. T. and Rueter, H. H., 1994. Organizational routines as grammars of action. *Administrative Science Quarterly*, 39(3), pp. 484–510.
- Pentland, B. T., Hærem, T. and Hillison, D., 2011. The (n) ever-changing world: Stability and change in organizational routines. *Organization Science*, 22(6), pp. 1369–1383.
- Pfeffer, J. and Salancik, G. R., 1974. Organizational decision making as a political process: The case of a university budget. *Administrative Science Quarterly*, 19(2), pp. 135–151.
- Pitkin Derosé, K. and Varda, D.M., 2009. Social capital and health care access: a systematic review. *Medical Care Research and Review*, 66(3), pp.272-306.
- Ponsignon, F., Maull, R. S. and Smart, P. A., 2014. Four archetypes of process improvement: a Q-methodological study. *International Journal of Production Research*, 52(15), pp. 4507–4525.
- Pope, C., van Royen, P. and Baker, R., 2002. Qualitative methods in research on healthcare quality. *Quality & Safety in Health Care*, 11(2), pp. 148–52.
- Portes, A., 1998. Social capital: Its origins and applications in modern sociology. *Annual review of sociology*, 24(1), pp.1-24.
- Power, M., 1997. From Risk Society to Audit Society. *Soziale Systeme*, 3(1), pp. 3–21.
- Proudlove, N., Moxham, C. and Boaden, R., 2008. Lessons for lean in healthcare from using Six Sigma in the NHS, *Public Money and Management*, 28(1), pp. 27–34.
- Punch, K. F., 2013. Introduction to social research: Quantitative and qualitative approaches. London: Sage.
- Putnam, R. D., 1995. Bowling alone: America's declining social capital. *Journal of Democracy*, 6(1), p.p. 65-78
- Radaelli, G., Lettieri, E. and Masella, C., 2015. Physicians' willingness to share: a TPB-based analysis. *Knowledge Management Research & Practice*, 13(1), pp. 91–104.

- Radnor, Z., Walley, P., Stephens, A. and Bucci, G., 2006. Evaluation of the lean approach to business management and its use in the public sector', *Research Findings*, (20), pp. 1–6.
- Ravichandran, T. and Rai, A., 2000. Quality management in systems development: an organizational system perspective. *MIS quarterly*, pp.381-415.
- Reagans, R., Argote, L. and Brooks, D., 2005. Individual Experience and Experience Working Together: Predicting Learning Rates from Knowing Who Knows What and Knowing How to Work Together. *Management Science*, 51(6), pp. 869–881.
- Reid, Y., Johnson, S., Morant, N., Kuipers, E., Szmukler, G., Thornicroft, G., Bebbington, P. and Prosser, D., 1999. Explanations for stress and satisfaction in mental health professionals: a qualitative study. *Social Psychiatry and Psychiatric Epidemiology*, 34(6), pp.301-308.
- Reijers, H. A. and Liman Mansar, S., 2005. Best practices in business process redesign: an overview and qualitative evaluation of successful redesign heuristics. *Omega*, 33(4), pp. 283–306.
- Reinertsen JL, Schellekens W, 2005, 10 Powerful Ideas for Improving Patient Care: What Every Healthcare Executive Should Know, Chicago, Illinois: Health Administrative Press with the Institute for Healthcare Improvement
- Repenning, N. P. and Sterman, J. D., 2001. Nobody ever gets credit for fixing problems that never happened: creating and sustaining process improvement, *California Management Review*, 43(4), pp. 64–88.
- Ricci, W.M., Gallagher, B., Brandt, A., Schwappach, J., Tucker, M. and Leighton, R., 2009. Is after-hours orthopaedic surgery associated with adverse outcomes?: a prospective comparative study. *JBJS*, 91(9), pp.2067-2072.
- Robbins, S., Barnwell, N. 2006, *Organisation theory: concepts and cases*, French Forest, N.S.W. Pearson Education Australia
- Saint, S., Hofer, T.P., Rose, J.S., Kaufman, S.R. and McMahon Jr, L.F., 2003. Use of critical pathways to improve efficiency: a cautionary tale. *The American Journal of Managed Care*, 9(11), pp.758-765.
- Sandberg, J., 2017. *Skillful performance: enacting capabilities, knowledge, competence, and expertise in organizations*. Oxford University Press.
- Saposnik, G., Baibergenova, A., Bayer, N. and Hachinski, V., 2007. Weekends: a dangerous time for having a stroke?. *Stroke*, 38(4), pp.1211-1215.

- Schnelle, J.F., Simmons, S.F., Harrington, C., Cadogan, M., Garcia, E. and M Bates-Jensen, B., 2004. Relationship of nursing home staffing to quality of care. *Health Services Research*, 39(2), pp.225-250.
- Schwandt, T. A., 1997. *Qualitative inquiry: A dictionary of terms*. US: Sage.
- Sehwail, L. and DeYong, C., 2003. Six Sigma in health care. *Leadership in Health Services*, 16(4), pp.1-5.
- Sewell, W. H., 1992. A Theory of Structure: Duality, Agency, and Transformation A Theory of Structure: Duality, Agency, and Transformation¹, *American Journal of Sociology*, 98(1), pp. 1–29.
- Shah, R. and Ward, P. T., 2007. Defining and developing measures of lean production. *Journal of Operations Management*, 25(4), pp. 785–805.
- Sheth, A., 1997. From contemporary workflow process automation to adaptive and dynamic work activity coordination and collaboration. *Database and Expert Systems Applications. 8th International Conference, DEXA '97. Proceedings*, 1-2 Sept. 1997, Toulouse, France. Los Alamitos, CA: IEEE Computer Society Press, pp. 24-27.
- Short, A.E., Short, K.T., Holdgate, A., Ahern, N. and Morris, J., 2011. Noise levels in an Australian emergency department. *Australasian Emergency Nursing Journal*, 14(1), pp.26-31.
- Siemens, E., Roth, A.V. and Balasubramanian, S., 2008. How motivation, opportunity, and ability drive knowledge sharing: The constraining-factor model. *Journal of Operations Management*, 26(3), pp.426-445.
- Silvester, K., Lendon, R., Bevan, H., Steyn, R. and Walley, P., 2004. Reducing waiting times in the NHS: is lack of capacity the problem?, *Clinician in Management*, 12(3).
- Skaggs B.C., Youndt M., 2004. Strategic positioning, human capital, and performance in service organizations: a customer interaction approach. *Strategic Management Journal*, 25 (1), pp. 85-89
- Smart, P. A., Maull, R. S., Childe, S. J. and Weaver, A. M., 1997. Integration in small and medium enterprises specification of a business process re-engineering methodology. In *Enterprise Engineering and Integration: Building International Consensus*, K. Kosanke and J. G. Nell, eds. Berlin: Springer, pp. 449 - 458.
- Smart, P.A., Maddern, H. and Maull, R.S., 2009. Understanding business process management: implications for theory and practice. *British Journal of Management*, 20(4),

pp.491-507.

Smart, P.A., Maull, R.S. and Childe, S.J., 1999. A reference model of 'operate' processes for process-based change. *International journal of computer integrated manufacturing*, 12(6), pp.471-482.

Sobolev, B. G., Sanchez, V. and Vasilakis, C., 2011. Systematic review of the use of computer simulation modeling of patient flow in surgical care, *Journal of Medical Systems*, 35(1), pp. 1–16.

Sole, D. and Edmondson, A., 2002. Situated knowledge and learning in dispersed teams, *British Journal of Management*, 13(S2), pp. S17–S34.

Sousa, R. and Voss, C. A., 2002. Quality management re-visited: a reflective review and agenda for future research. *Journal of Operations Management*, 20(1), pp. 91–109.

Srivastava, A., Bartol, K.M. and Locke, E.A., 2006. Empowering leadership in management teams: effects on knowledge sharing, efficacy, and performance, *Academy of Management Journal*, 49(6), pp. 1239-1251.

Stauss, B. and Weinlich, B., 1997. Process-oriented measurement of service quality: applying the sequential incident technique. *European Journal of Marketing*, 31(1), pp. 33–55.

Sternberg, R. J., 1999. The theory of successful intelligence. *Review of General Psychology*, 3(4), pp. 292–316.

Stirman, S.W., Kimberly, J., Cook, N., Calloway, A., Castro, F. and Charns, M., 2012. The sustainability of new programs and innovations: a review of the empirical literature and recommendations for future research. *Implementation Science*, 7(1), pp.17-36.

Supper, I., Catala, O., Lustman, M., Chemla, C., Bourgueil, Y. and Letrilliart, L., 2014. Interprofessional collaboration in primary health care: a review of facilitators and barriers perceived by involved actors. *Journal of Public Health*, 37(4), pp.716-727.

Suryani, A., 2008 Comparing Case Study and Ethnography as Qualitative Research Approaches. *Jurnal Ilmu. Komunikasi*, 5(1), pp. 117-127

Swinglehurst, D., Greenhalgh, T., Myall, M. and Russell, J., 2010. Ethnographic study of ICT-supported collaborative work routines in general practice. *BMC Health Services Research*, 10(1), pp.348-357.

- Swinglehurst, D., Greenhalgh, T., Russell, J. and Myall, M., 2011. Receptionist input to quality and safety in repeat prescribing in UK general practice: ethnographic case study. *BMJ: British Medical Journal*, 343, pp. 6788-6799.
- Sydow, J., Schreyögg, G. and Koch, J., 2009. Organizational path dependence: Opening the black box. *Academy of Management Review*, 34(4), pp. 689–709.
- Tang, D. and Baker, M., 2000. Analysis of a local-area wireless network. *Proceedings of the 6th annual international conference on Mobile computing and networking - MobiCom '00*, August 06 - 11, 2000, Boston, Massachusetts, USA. New York, NY, USA: ACM Press, pp. 1–10.
- Teboul, J., 2006. Toward a New Definition of Services, In: J. Teboul ed. *Service is Front Stage*. London: Palgrave Macmillan UK, pp. 4–18.
- Teddlie, C. and Tashakkori, A., 2003. Major issues and controversies in the use of mixed methods in the social and behavioural sciences. In: T., Abbas, T., Charles, *Handbook of mixed methods in social & behavioural research*. US: Sage.
- Thomas, G., 2011. A typology for the case study in social science following a review of definition, discourse, and structure. *Qualitative Inquiry*, 17(6), pp. 511–521.
- Tijunelis M., Fitzsullivan E. and Henderson S., 2005. Noise in the ED. *The American journal of emergency medicine*. 23(3), pp.332-335
- Ting, H.H., Shojania, K.G., Montori, V.M. and Bradley, E.H., 2009. Quality improvement. *Circulation*, 119(14), pp.1962-1974.
- Tomoaia-Cotisel, A., Scammon, D.L., Waitzman, N.J., Cronholm, P.F., Halladay, J.R., Driscoll, D.L., Solberg, L.I., Hsu, C., Tai-Seale, M., Hiratsuka, V. and Shih, S.C., 2013. Context matters: the experience of 14 research teams in systematically reporting contextual factors important for practice change. *The Annals of Family Medicine*, 11(1), pp. S115-S123.
- Torres, D., 1991. What, if anything is professionalism. *Institutions and the problem of change. Research in the Sociology of Organizations*, 8, pp. 43-68.
- Tranfield, D. and Smith, S., 1998. The strategic regeneration of manufacturing by changing routines. *International Journal of Operations & Production Management*, 18(2), pp.114-129.
- Tsoukas, H. and Chia, R., 2002. On organizational becoming: Rethinking organizational change. *Organization Science*, 13(5), pp. 567–582.

- Tsoukas, H., 1996. The firm as a distributed knowledge system: a constructionist approach. *Strategic Management Journal*, 17, pp. 11–25.
- Tucker, A. L. and Edmondson, A. C., 2002. Advances in Health Care Management Managing routine exceptions: A model of nurse problem solving behaviour. *Journal of Organizational Change Management*, 15(2), pp. 122–137.
- Tucker, A. L. and Edmondson, A. C., 2003. Why hospitals don't learn from failures: organizational and psychological dynamics that inhibit system change. *California Management Review*, 45(2), pp. 55–72.
- Tucker, A. L. and Singer, S. J., 2015. The Effectiveness of Management-By-Walking-Around: A Randomized Field Study. *Production and Operations Management*, 24(2), pp. 253–271.
- Tucker, A. L. and Spear, S. J., 2006. Operational Failures and Interruptions in Hospital Nursing. *Health Services Research*. 41(3 Pt 1), pp. 643–662.
- Tucker, A. L., 2004. The impact of operational failures on hospital nurses and their patients. *Journal of Operations Management*, 22(2), pp. 151–169.
- Tucker, A. L., 2007. An Empirical Study of System Improvement by Frontline Employees in Hospital Units. *Manufacturing & Service Operations Management*, 9(4), pp. 492–505.
- Tucker, A. L., 2016. The Impact of Workaround Difficulty on Frontline Employees' Response to Operational Failures: A Laboratory Experiment on Medication Administration. *Management Science*, 62(4), pp. 1124–1144.
- Tucker, A. L., Heisler, W. S. and Janisse, L. D., 2013. *Organizational factors that contribute to operational failures in hospitals*. Working Paper 14-023, Boston, Mass, USA: Harvard Business School, Harvard University
- Tucker, A.L., 2009. *Workarounds and resiliency on the front lines of health care*. Rockville, MD: Agency for Healthcare Research and Quality, 2.
- Turner, J.H. and Turner, P.R., 1978. The structure of sociological theory. Homewood, IL: Dorsey Press.
- Turner, S. F. and Fern, M. J., 2012., Examining the stability and variability of routine performances: the effects of experience and context change. *Journal of Management Studies*, 49(8), pp. 1407–1434.
- Tyre, M.J. and Von Hippel, E., 1997. The situated nature of adaptive learning in organizations. *Organization Science*, 8(1), pp.71-83.

- Unertl, K.M., Weinger, M.B. and Johnson, K.B., 2006. Applying direct observation to model workflow and assess adoption. *AMIA Annual Symposium Proceedings*. 2006(0), pp. 794-798
- Uzzi, B., 1997. Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness. *Administrative Science Quarterly*, 42(1), pp. 35-67.
- Van Der Vegt, G.S. and Bunderson, J.S., 2005. Learning and performance in multidisciplinary teams: The importance of collective team identification. *Academy of Management Journal*, 48(3), pp.532-547.
- Van Gerven, E., Vanhaecht, K., Deneckere, S., Vleugels, A. and Sermeus, W., 2010. Management challenges in care pathways: conclusions of a qualitative study within 57 health-care organizations. *International Journal of Care Pathways*, 14(4), pp.142-149.
- Van Gerven, E., Vanhaecht, K., Deneckere, S., Vleugels, A. and Sermeus, W., 2010. Management challenges in care pathways: conclusions of a qualitative study within 57 health-care organizations. *International Journal of Care Pathways*, 14(4), pp.142-149.
- van Leijen-Zeelenberg, J.E., Elissen, A.M., Grube, K., Van Raak, A.J., Vrijhoef, H.J., Kremer, B. and Ruwaard, D., 2016. The impact of redesigning care processes on quality of care: a systematic review. *BMC Health Services Research*, 16(1), pp.19-42.
- van Leijen-Zeelenberg, J.E., van Raak, A.J., Duimel-Peters, I.G., Kroese, M.E., Brink, P.R. and Vrijhoef, H.J., 2015. Interprofessional communication failures in acute care chains: How can we identify the causes?. *Journal of Interprofessional Care*, 29(4), pp.320-330.
- van Raak, A., Groothuis, S., van der Aa, R., Limburg, M. and Vos, L., 2010. Shifting stroke care from the hospital to the nursing home: explaining the outcomes of a Dutch case. *Journal of Evaluation in Clinical Practice*, 16(6), pp.1203-1208.
- van Raak, A., Paulus, A., Cuijpers, R. and Te Velde, C., 2008. Problems of integrated palliative care: A Dutch case study of routines and cooperation in the region of Arnhem. *Health & Place*, 14(4), pp.768-778.
- Vanninen, R., 2013. Generating transformative agency in a split community of greenhouse growers. Presentation at the Summer School in Activity Theory and Formative Intervention.
- Vera, A. and Kuntz, L., 2007. Process-based organization design and hospital efficiency. *Health Care Management Review*, 32(1), pp. 55–65.
- Vera, D. and Crossan, M., 2004. Strategic leadership and organizational learning. *Academy of Management Review*, 29(2), pp.222-240.

- Visser, J. and Beech, R., 2005. *Health operations management: patient flow logistics in health care*. Routledge, London, UK: Routledge Health Management.
- Vos, L. et al. (2010) 'Does case-mix based reimbursement stimulate the development of process-oriented care delivery?', *Health Policy*, 98(1), pp. 74–80.
- Vos, L., Dücker, M.L., Wagner, C. and van Merode, G.G., 2010. Does case-mix based reimbursement stimulate the development of process-oriented care delivery?. *Health Policy*, 98(1), pp.74-80.
- Walley, P., Silvester, K., Steyn, R. and Conway, J.B., 2006. Managing Variation in Demand: Lessons from the UK National Health Service/PRACTITIONER APPLICATION. *Journal of Healthcare Management*, 51(5), pp.309-320.
- Wang, S. and Noe, R. A., 2010. Knowledge sharing: A review and directions for future research. *Human Resource Management Review*, 20(2), pp. 115–131.
- Waring, J. J. and Bishop, S., 2010. Lean healthcare: Rhetoric, ritual and resistance. *Social Science and Medicine*, 71(7), pp. 1332–1340.
- Wears R, Perry S, Wilson S, Galliers J, Fone J. 2007. Emergency department status boards: User evolved artifacts for inter-and intra-group coordination. *Cognition, Technology and Work*. 9, pp.163-170.
- Weick, K. E., 1993. The Collapse of Sensemaking in Organizations: The Mann Gulch Disaster, *Administrative Science Quarterly*, 38(4), pp. 628–652.
- Winter, S. G. and Nelson, R. R., 1982. An evolutionary theory of economic change. In: J. Nicolai Foss ed, *Resources, Firms, and Strategies. A Reader in the Resource-Based Perspective*. Oxford: Oxford University Press, pp.82-99.
- World Healthcare Organisation (W.H.O). 2015. Atlas of heart disease and stroke. 2015, Geneva: WHO
- Xiao Y. 2005. Artifacts and collaborative work in healthcare: Methodological, theoretical, and technological implications of the tangible. *J Biomed Inform*. 38, pp. 26-33
- Yam, R.C. and Chan, C., 2015. Knowledge sharing, commitment and opportunism in new product development. *International Journal of Operations & Production Management*, 35(7), pp.1056-1074.
- Yasin, M.M., Zimmerer, L.W., Miller, P. and Zimmerer, T.W., 2002. An empirical investigation of the effectiveness of contemporary managerial philosophies in a hospital

operational setting. *International Journal of Health Care Quality Assurance*, 15(6), pp.268-276.

Yin, R. K., 2014. *Case study research: Design and methods*. US: Sage.

Young, T. P. and McClean, S. I., 2008. A critical look at Lean Thinking in healthcare. *Quality and Safety in Health Care*, 17(5), pp. 382–386.

Zahra, S. A. and George, G., 2002. Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review*, 27(2), pp. 185–203.

Zhang J, Norman D. 1994. Representations in distributed cognitive tasks. *Cognitive Science*, 18, pp.87-122.

Zhang, J., 1997. The nature of external representations in problem solving. *Cognitive science*, 21(2), pp.179-217.

Zheng, H., Li, D., Wu, J. and Xu, Y., 2014. The role of multidimensional social capital in crowdfunding: A comparative study in China and US. *Information & Management*, 51(4), pp.488-496.

7 Appendix

A. Literature Review

Error! Reference source not found.1 below summarises a combination of the findings from both OM and ORs literatures that can explain challenges of healthcare organisations in adopting OM approaches. The papers analysed and used for this review and referred to these issues from each body of literature are also presented.

Factors	Description of OM	Papers from the OM literature	Papers from the ORs literature
Subcategories			
Variable work processes	Uncontrollable uncertainty in demand and patient characteristics influences the way individuals implement new practices.	(Gittell <i>et al.</i> , 2000; Nembhard <i>et al.</i> , 2009; Cheung <i>et al.</i> , 2010; DelliFraine, Langabeer and Nembhard, 2010; Grove <i>et al.</i> , 2010; Lifvergren <i>et al.</i> , 2010; Dobrzykowski, McFadden and Vonderembse, 2016)	
Professional inputs	High levels of specialisation and knowledge-based actions Individuals possess different skills and abilities that impact the way that they practice their roles.		(Becker, 2004; Greenhalgh, Russell and Swinglehurst, 2005; Greenhalgh, Voisey and Robb, 2007; Abell, Felin and Foss, 2008; Greenhalgh, 2008; Felin and Foss, 2009; Swinglehurst <i>et al.</i> , 2011; Hilligoss and Cohen, 2011; Novak <i>et al.</i> , 2012; Chao, 2016; LeBaron <i>et al.</i> , 2016)
	Individual autonomy and monopolisation of knowledge High levels of specialisation lead to significant levels of medical practitioner autonomy causing challenges for inter-professional collaboration.	(Tucker, 2004; Reinertsen and Schellekens, 2005; Buttell, Hendler and Daley, 2007; Leape <i>et al.</i> , 2009; Grove <i>et al.</i> , 2010; Hellström, Åslund and Nielsen, 2010; Boyer, Gardner and Schweikhart, 2012)	
	Professional norms and codes To many healthcare practitioners, implementation of an innovation may appear inconsistent with their occupational norms, impacting their attitudes towards innovations, and subsequent level of compliance.	(Yasin <i>et al.</i> , 2002; Nembhard <i>et al.</i> , 2009; Papadopoulos, Radnor and Merali, 2011)	
Resource management	Efficiency of administrative support and adequate resourcing are of paramount importance for the outcome of the project.		(Tucker and Edmondson, 2003; Grimshaw <i>et al.</i> , 2004; De Vos <i>et al.</i> , 2009; Kaplan <i>et al.</i> , 2010, 2012; 2015)

Interpersonal	Social capital Working relationships, trust, mutual respect and shared goals and interests impact collaborative potential of practitioners.		(Uzzi, 1997; Tang and Baker, 2000; Feldman, 2000; Edmondson, Bohmer and Pisano, 2001; Tucker and Edmondson, 2002; Becker, 2005; Greenhalgh, 2008; Lazaric, 2008; Haque, 2010; Gittel, 2011; Turner and Fern, 2012; Dobrzykowski and Tarafdar, 2015; Dittrich, Guérard and Seidl, 2016; LeBaron <i>et al.</i> , 2016)
	Shared knowledge: Different interpretations of the process influences practitioners' ability to collaborate.		(McKnight <i>et al.</i> , 2002; Cohendet and Llerena, 2003; Greenhalgh, Russell and Swinglehurst, 2005; Unertl, Weinger and Johnson, 2006; Greenhalgh, Voisey and Robb, 2007; 2010, 2008; Haque, 2010; Dittrich, Guérard and Seidl, 2016; LeBaron <i>et al.</i> , 2016; van Leijen-Zeelenberg <i>et al.</i> , 2016)
Interaction between the professionals and the organisations	Hierarchical structure High levels of specialisation lead to the creation of a hierarchical structure that negatively impacts on the needed culture of flexibility and discourages practitioners from collaborating.	(Adler <i>et al.</i> , 2003; Tucker and Edmondson, 2003; Van Der and Bunderson, 2005; Joosten, Bongers and Janssen, 2009; Nembhard <i>et al.</i> , 2009; de Souza and Pidd, 2011b)	(Edmondson, Bohmer and Pisano, 2001; Greenhalgh, 2008; Chao, 2016)
	Managerial control Due to high levels of medical expertise and professional autonomy, healthcare managers have limited control over their employees.	(Osidach and Fu, 2003; Sehwal and Deyong, 2003; Proudlove, Moxham and Boaden, 2008; Hellstrom, Lifvergren and Quist, 2009; Nembhard <i>et al.</i> , 2009; DelliFraine, Langabeer and Nembhard, 2010; Hellström, Åslund and Nielsen, 2010; Lifvergren <i>et al.</i> , 2010; Tucker and Singer, 2015; Agarwal <i>et al.</i> , 2016, 2016)	(Greenhalgh, Voisey and Robb, 2007; Greenhalgh, 2008; van Raak <i>et al.</i> , 2008; Habib and Krohmer, 2016; Innis and Berta, 2016)
	Strategy development Failure of hospital managers to truly understand the organisational processes in order to re-design them.	(Sehwail and Deyong, 2003; Vera and Crossan, 2004; Proudlove, Moxham and Boaden, 2008; Hellstrom, Lifvergren and Quist, 2009; Nembhard <i>et al.</i> , 2009; Hellström, Åslund and Nielsen, 2010; Kaplan <i>et al.</i> , 2012; Dionne S. Kringos <i>et al.</i> , 2015; Tucker and	

			Singer, 2015; Agarwal <i>et al.</i> , 2016)	
		Organisational support Limited organisational support such as provision of training, development and feedback opportunities. Failure of artefacts to accurately capture and illustrate practical reality of routines.	(Brown, Tucker and Domokos, 2003; Sehswail and Deyong, 2003; Tucker and Edmondson, 2003; Hellstrom, Lifvergren and Quist, 2009; Hellström, Åslund and Nielsen, 2010; Tomoaia-Cotisel <i>et al.</i> , 2013; Dionne S. Kringos <i>et al.</i> , 2015; Agarwal <i>et al.</i> , 2016)	(D’Adderio, 2001, 2008; Pentland and Feldman, 2008; van Raak <i>et al.</i> , 2008; Bohmer and Lee, 2009; Elissen, Van Raak and Paulus, 2011; Hayes, Lee and Dourish, 2011; Hilligoss and Cohen, 2011; Novak <i>et al.</i> , 2012; Constantinides and Barrett, 2012; Novak, 2012; Aroles and McLean, 2016; Chao, 2016)
		Physical environments Physical environment (i.e. equipment, work setting) enables and restricts practitioners in the performance of routines.	(Brown, Tucker and Domokos, 2003; Tucker and Edmondson, 2003; Grimshaw <i>et al.</i> , 2004; De Vos <i>et al.</i> , 2009; Kaplan <i>et al.</i> , 2012; Tucker and Singer, 2015)	(Edmondson, Bohmer and Pisano, 2001; 2004; Greenhalgh, Voisey and Robb, 2007; Hellström, Åslund and Nielsen, 2010; Elissen, Van Raak and Paulus, 2011; Swinglehurst <i>et al.</i> , 2011; Cacciatori, 2012; Miller, Choi and Pentland, 2014; Agarwal <i>et al.</i> , 2016)
		Routine artefacts Physical description of routines, such as operating procedures, scripts, protocols or any other artefact used within routine practice to assist practitioners in carrying out their tasks may fail to accurately capture practical reality of routines (i.e. heterogeneity in individuals’ characteristics, contextual characteristics etc). This leads to unintended variations within routine performances.	(D’Adderio, 2001, 2008; Edmondson, Bohmer and Pisano, 2001; Pentland and Feldman, 2008; van Raak <i>et al.</i> , 2008, 2010; Swinglehurst <i>et al.</i> , 2011; Goh, Gao and Agarwal, 2011; Hayes, Lee and Dourish, 2011; Hilligoss and Cohen, 2011; Novak <i>et al.</i> , 2012; Novak, 2012; Constantinides and Barrett, 2012; Aroles and McLean, 2016; Chao, 2016)	
Broader contextual and environmental factors	Socio-political influences	The regulatory framework within which the pathway is implemented may restrict the actions of practitioners, create	(Klein and Sorra, 1996; Myers, Kaplan and Shaheen, 2009; Grove <i>et al.</i> , 2010; Kaplan <i>et al.</i> , 2012;	(Greenhalgh, Voisey and Robb, 2007; Essén, 2008; Greenhalgh, 2008; van Raak <i>et al.</i> , 2008)

		collaboration issues and lead to lower quality of care.	Löfgren <i>et al.</i> , 2012; Dionne S. Kringos <i>et al.</i> , 2015)	
--	--	---------------------------------------------------------	-----------------------------------------------------------------------	--

Table 7.7.1: Overview of literatures on factors that influence operations process management initiatives found in healthcare settings in OM & ORs literatures

B. The case study

The form that the ASE staff & paramedics fill in:

TALK THROUGH

2015

ndition.

<input type="text"/>	:	<input type="text"/>
<input type="text"/>	:	<input type="text"/>
<input type="text"/>	:	<input type="text"/>

Figure 7.1: The form used by Paramedics to assess patients in the ambulance.

C. Methodology

Sample of Semi-Structured Interview Phase 1

Aim of the Interview: Familiarisation of researcher with the stroke care process

1. Can you please describe to me the patient flow of a patient diagnosed with acute stroke?

2. Who are the main care members of this care process?

3. Can you please describe to me your routine (process of care) as
a.....?

4. How many..... are you in total?

5. Who arranges your working patterns?

Sample of researcher's diary kept during the field study

(3) She is again complaining about the ^{today} on-call consultant. His writing is difficult for her to understand and also she feels he is very slow and tiring for her to work with him.

(4) SNP went to MAU to look for the patients. Finally, they are both ~~there~~ to ASU but she could not find them. Comm - frequent.

Sunday 18/10/2015

(1) SNP is assisting in the ward.

(2) The whole ward & hospital again is less crowded & busy today. (3) SNP found a patient with some symptoms of stroke in the patient staff. However, it is not clear that it may be stroke and she preferred not going down and get involved with this assessment because, she ~~tells~~ ^{thinks} that she will do all the jobs and he may not be stroke.

(4) I ~~came~~ ^{no patient came in} this morning and still ~~don't~~ ^{can't} receive ~~process~~ ^{process}.

(5) ASE told to ASU to inform them that there is a stroke patient in ASE. They didn't bleep SNP. The stroke nurse who received the call got annoyed because they should bleep the SNP and not call in ASU. They should be aware that there's SNP available.

(6) Stroke nurse informed her. It is the patient who she saw in the system before.

(8) SNP came down to assess him. She is talking to the ASE doc. She gives her a handover.

(9) ASE doc. ordered a CT scan for him and she will refer him to the medical team which will see him tomorrow.

(10) SNP will put him on BRAMIS finally.

(11) She is assessing him. (12) The ASE doc. wasn't aware that there is SNP service today that's why she didn't bleep her.

(13) SNP contacted ASU, informed stroke nurse, gave handover.

(14) Patient is waiting for his CT scan.

(15) I came yesterday and wasn't reviewed by SNP because she was very busy dealing with other patients. When she went to have a look at him they told her that he probably had done a scan, it is not diagnosed with stroke. Also she didn't want to get involved because from the initial symptoms he didn't seem to have stroke.

Finally, the patient was discharged and came back today and diagnosed with most probable stroke.

(16) SNP is ordering a chest X-Ray.

(17) ASE doc. contacted CT scan again to see if they will take the patient. They are taking him now.

(18) SNP will be accompanying him.

Note: ASE is very quiet this morning. Not a lot of people

Figure 7.2: Sample of Field No

Descriptive analysis of data for each patient for 5 stages, observed/collected from interviews

Patient number	Ambulance alerted yes/no	pre-Day	Time	Sub processes observed				
				Pre-arrival at the hospital	ED admission	Brain imaging	ED clerking and decision-making	Admission to ASU
1	No	Thursday	Morning	√	√		√	
2	No		Morning	√	√		√	√
3	No		Afternoon	√	√		√	√

4	Yes	Friday	Afternoon				√	
5	Yes		Afternoon	√	√	√	√	
6	No	Tuesday	Morning	√	√		√	
7	Yes		Afternoon		√		√	
8	No		Afternoon	√	√		√	√
9	Yes	Wednesday	Afternoon	√				
10	No	Saturday	Morning	√	√		√	√
11	No	Monday	Morning	√				
12	Yes		Morning	√	√		√	
13	Yes		Afternoon					
14	No		Afternoon	√	√			
15	No	Tuesday	Morning	√	√		√	
16	Yes		Morning	√	√		√	√
17	Yes		Morning		√	√	√	
18	No		Morning	√	√		√	
19	Yes		Afternoon	√	√	√	√	
20	Yes		Afternoon	√	√	√	√	
21	Yes	Tuesday	Morning	√	√	√	√	
22	No		Afternoon	√	√			
23	No		Afternoon			√	√	
24	Yes	Monday	Afternoon	√	√		√	
25	No	Tuesday	Afternoon		√		√	
26	No	Sunday	Morning	√	√		√	
27	Yes		Afternoon	√	√		√	√
28	No	Thursday	Morning		√			
29	No		Morning		√		√	√

30	No		Afternoon	√	√		√	
31	No		Afternoon		√		√	
32	No	Friday	Morning	√				
33	No		Afternoon	√	√		√	
34	No	Saturday	Evening	√				
35	No	Monday	Morning	√	√		√	
36	No			√	√		√	
37	Yes	Wednesday	Morning	√	√		√	
38	No		Afternoon	√	√	√	√	
39	No		Afternoon	√	√		√	
40	No		Afternoon	√	√		√	
41	No		Afternoon	√	√		√	
42	Yes	Saturday	Morning		√	√	√	
43	Yes		Afternoon	√	√		√	
44	Yes		Afternoon	√	√		√	
45	Yes	Monday	Morning	√	√		√	√
46	Yes		Afternoon	√	√		√	√
47	Yes		Afternoon	√	√		√	√
48	Yes	Thursday	Morning	√	√		√	√
49	No		Morning	√	√		√	
50	Yes		Afternoon	√	√		√	
51	Yes	Sunday	Noon time	√	√		√	√
52	Yes		Afternoon	√	√		√	
Total				40	45	8	45	12

Table 7.7.2: Analysis of the stages observed in each pathway instance

Coding Scheme

Differences between the ostensive script (mapping process) and the performative aspect				
Sub-categories of Differences	Description	Example	Causal factor	Impact
Workflow/ process related				
Differences in practice of care related to the process-stroke care pathway				
Order	Process steps were taken in a different sequence	Patient was admitted to ASU before the SNP clerked him	<ul style="list-style-type: none"> • Shortage of beds in ED • Departmental workload • Staffing issue (did not know the process well) 	<ul style="list-style-type: none"> • Unknown
Paused	Process paused for a while – no one was dealing with the patient's assessment	Patient was waiting in ED for 2 hours without anyone assessing him.	<ul style="list-style-type: none"> • Practitioner workload • Bed unavailability in ASU • Unavailability of diagnostic tests 	<ul style="list-style-type: none"> • Patient care (delay of specialised care)
Temporal	Delay of diagnosis and medical tests	CT scan was delayed	<ul style="list-style-type: none"> • Unavailability of specialist staff • Departmental workload • Staff shortage 	<ul style="list-style-type: none"> • Delay of decision-making • Delay of specialised care • Patient flow issues • Patient care (delay of specialised care)
	Patient's medical assessment was delayed	Patient was reviewed by the SNP / ED doctor/MAU doctor but, some hours after admission	<ul style="list-style-type: none"> • Department business • Shortage of specialised staff • Communication timeliness 	<ul style="list-style-type: none"> • Delay of decision-making • Patient care (delay of specialised care)

Re-work	Actions or events included in the ostensive aspect of care happened more than once	Swallowing test was performed twice	<ul style="list-style-type: none"> • Handover mechanism issues • Communication accuracy 	<ul style="list-style-type: none"> • Increase of practitioners' workload •
Actor	Differences in the number of events or role of actors involved in the process	SNP did not accompany the patient to the CT scan	<ul style="list-style-type: none"> • Practitioner workload • Lack of confidence for decision-making based on their professional competencies. • Communication frequency/timeliness 	<ul style="list-style-type: none"> • Increase of practitioners' workload
Role seniority	The seniority of the doctor who reviewed the patient was not of the specified level	Patient was first reviewed by the ED nurse practitioner instead of an ED doctor	<ul style="list-style-type: none"> • Unavailability of specialist staff • Practitioner workload 	<ul style="list-style-type: none"> • Diagnostic accuracy • Communication frequency
Location	Differences in where the patients are located and/or transferred to after admission OR differences where events take place	Patient was admitted to C-bay instead of D-bay in ASU	<ul style="list-style-type: none"> • Bed unavailability in ASU • Specialist staff shortage • Time targets 	<ul style="list-style-type: none"> • Patient as medical outlier
Communication Differences in practice of care related to communication				
Information accuracy	Information was unavailable or inaccurate	Information written on patient's notes did not reflect information in the system	<ul style="list-style-type: none"> • Patient's issues • Handover mechanism 	<ul style="list-style-type: none"> • Communication frequency • Communication happened between the wrong persons • Medical errors
Mechanism	The communication between care members happened in a different way than specified	The SNP needed to visit the ward and to communicate with the ASU instead of phoning them.	<ul style="list-style-type: none"> • Unavailability of specialised staff • Practitioner workload • Information unavailable 	<ul style="list-style-type: none"> • Communication timeliness • Delay of medical assessment

			<ul style="list-style-type: none"> • Oral miscommunication between practitioners 	<ul style="list-style-type: none"> • Delay of decision-making
Frequency	Communication between the practitioners did not occur at all/occurred more than once	<p>SNP contacted the ASU 3 times</p> <p>ED staff did not inform SNP about patient's arrival</p>	<ul style="list-style-type: none"> • Handover mechanism issues • Lack of specialised knowledge • Practitioner workload (ASU/ED) • Lack of shared knowledge 	<ul style="list-style-type: none"> • Delay of medical assessment • Delay of decision-making • Information accuracy • Relational conflicts
Temporal	Communication between practitioners did not occur at the appropriate time	The ED coordinator informed SNP about the patient's arrival 20 mins after the patient had arrived.	<ul style="list-style-type: none"> • Unavailability of specialised staff • Practitioner workload • Lack of shared knowledge 	<ul style="list-style-type: none"> • Delay of medical assessment • Delay of decision-making • Information inaccuracy
Wrong persons	Communication did not take place between the specified practitioners	The SNP contacted the stroke consultant who was not on-call that day.	<ul style="list-style-type: none"> • Practitioners' professional relationships • Information accuracy 	<ul style="list-style-type: none"> • Increase of practitioners' workload
Handover Differences in practice of care related to the handover happening between practitioners				
Frequency	Handover between practitioners happened more or less often than it should	The SNP gave a handover for the patient to the ED doctor 3 different times since he was dealing with 2 other patients and he needed to leave the process multiple times.	<ul style="list-style-type: none"> • Practitioner workload 	<ul style="list-style-type: none"> • Delay of medical assessment • Delay of decision-making • Information inaccuracy
Temporal	Handover between practitioners did not happen at the specified time	The SNP gave a handover to the stroke nurse 1 hr after patient was admitted to D-bay as the stroke nurse was busy caring for other patients.	<ul style="list-style-type: none"> • Practitioner workload 	<ul style="list-style-type: none"> • I do not know

Organisational				
Differences in practice of care related to the organisation of care processes				
Staffing level	The required number of staff was different	There was only 1 SNP instead of 2 available	<ul style="list-style-type: none"> • Staffing issues • Hospital staff management (take nurses from ASU to work in other wards) • 	<ul style="list-style-type: none"> • Delay of medical assessment • Increase to practitioners' stress and anxiety • Patient care • Work of other care members
Unavailability of diagnostic and treatment services	Diagnostic or treatment services were unavailable at time of request.	There was no CT scan slot available, patient delayed in ED.	<ul style="list-style-type: none"> • Shared resource dependency • Departmental workload • Level of patient's urgency 	<ul style="list-style-type: none"> • Delay of decision-making • Process-paused/out of order
Bed unavailability	There was no bed available for the patient to be admitted to	There was no bed available in ASU and patient was transferred to MAU.	<ul style="list-style-type: none"> • Departmental workload • Insufficient management of hospital beds • Patient discharge issues 	<ul style="list-style-type: none"> • Medical outlier - Patient from other ward was admitted in ASU due to bed shortage in that ward • Communication frequency • Delay of medical assessment
Decision-making – medical knowledge				
Differences in practice of care related to decision-making for treatment or medical diagnosis of the patient				
Accuracy	The initial diagnosis of the patient was wrong or incomplete.	Patient was treated as TIA but subsequently diagnosed with stroke after SNP assessment.	<ul style="list-style-type: none"> • Specialised knowledge and skills • Lack of professional confidence decision making based on their competence • Patient's issues • Information accuracy 	<ul style="list-style-type: none"> • Delay of medical assessment • Patient medical outlier • Increase in practitioners'

			<ul style="list-style-type: none"> • Departmental workload • Time targets 	
Consistency	The practitioners shared differing opinions regarding diagnosis and/or treatment of the patient.	ED Consultant made a different diagnosis from the stroke consultant	<ul style="list-style-type: none"> • Staff training • Specialised knowledge and skills • Inefficient diagnostic tests 	<ul style="list-style-type: none"> • Delay of decision-making • Decision-making accuracy
Temporal	Decision-making was delayed	Firm diagnosis of a patient delayed to the following day.	<ul style="list-style-type: none"> • Specialised knowledge and skills • Lack of professional confidence decision making based on their competence • Unavailability of medical and diagnostic tests. 	<ul style="list-style-type: none"> • Patient care (delay of specialised care)
Patient Differences in practice of care related to patients' characteristics				
Patient issues	Due to patient issues (e.g. co-morbidities, availability of information) the process was not followed	The patient was very ill and was unable to have his scan immediately		<ul style="list-style-type: none"> • CT scan was booked and then cancelled
Issues Issues were defined as any difference or factor that caused variation to the care practice but was not a direct difference between ostensive and performative aspects, but lead to their variation.				
Professional Issues of stroke care practice related to the profession/role of individuals				
Medical knowledge	Variations in specialist stroke care knowledge and education between practitioners	One of the ED consultants is more specialised on stroke care and all the others check with this ED consultant before making decisions	<ul style="list-style-type: none"> • Frequency of practicing stroke care • Medical interest and specialisation 	<ul style="list-style-type: none"> • Decision-making accuracy • Communication frequency • Process delay

Professional confidence	Variation of individuals' confidence in making medical decisions	Some ED consultants felt more confident making decisions without input from stroke consultant.	<ul style="list-style-type: none"> Professional experience & practice Specialised knowledge Contact with the patient Personal professional evaluation 	<ul style="list-style-type: none"> Delay of decision-making Communication frequency Increase of practitioners involved in the process Information inaccuracy Process delay Lack of shared knowledge
Professional identity	Differences due to identity dynamics between the different practitioners	Stroke consultants were reluctant to undertake ED patients' assessment as they believed that this was outside the scope of their role	Unknown	<ul style="list-style-type: none"> Lack of teamwork and mutual support
Authority and Status	Level of authority varies between practitioner roles.	Although stroke consultant and SNP believed that patient needed CT scan, ED consultant decided not to do it.	<ul style="list-style-type: none"> Practitioner role responsibility Seniority of the practitioner 	<ul style="list-style-type: none"> Delay of decision-making – restriction of freedom in practice
Relationship with the patient	Differences in the relationship between the professional groups and the patients.	<p>ED consultants had no contact with patients after they left ED.</p> <p>Radiologists had no personal contact with patients at all.</p>	<ul style="list-style-type: none"> Practitioner role 	<ul style="list-style-type: none"> Delay of decision-making Decrease of altruistic interest Lack of professional evaluation
	Individual characteristics Characteristics unique to everyone that impacted the stroke care practice			
Personal goals and objectives	Differences in personal goals and objectives between individuals.	One of the ED consultants had personal interest in stroke and was motivated to improve stroke care pathway and meet governmental targets.	<ul style="list-style-type: none"> Personal medical interest Personal professional experience 	<ul style="list-style-type: none"> Process timeliness Patient care

Personal values	Differences in ethical and professional values between individuals.	The SNP did not want to move patient out from D-bay because she was not sure this was best for him. Although SNPs were pressuring her to arrange a bed for a patient she delayed doing so.	Unknown	<ul style="list-style-type: none"> • Unknown
Professional social network	The social network - relationship of the member with the care members of the same departmental or non-departmental groups had a different impact on the practice of process.		<ul style="list-style-type: none"> • Past professional experience • Professional role 	<ul style="list-style-type: none"> • Communication frequency • Decision-making
Organisational Issues or differences in the way stroke care is organised				
Role substitution and blurring	Practitioners committed tasks of and were undertaking the role of other care members.	<p>The SNP completed the whole medical assessment of the patient since no ED practitioners were available.</p> <p>The SNP completed discharge summary of the patient as the stroke nurse was busy dealing with another patient.</p> <p>The SNP undertook both outreach and on-site roles.</p>	<ul style="list-style-type: none"> • Practitioner workload • Staff shortage • Mutual support 	<ul style="list-style-type: none"> • Increase of practitioners' workload • Increase of practitioners' levels of stress and anxiety • Relational issues – trust, conflicts • Patient care
Group design	Group structure of each profession differed between and within days.	There was no stroke consultant after 5pm but there was an SNP until 9:30pm.	Unknown	<ul style="list-style-type: none"> • Communication frequency • Information inaccuracy • Increase of staffs' workload • Delay in decision-making
Professional commitments	The individuals had conflicting professional commitments that did not allow them to practice their care	The stroke consultant was doing a ward round and could not come down to the ED immediately when he received the call from the SNP.	Unknown	<ul style="list-style-type: none"> • Lack of commitment to patient care (relationship with the patient)

	on time and/or according to protocol.			<ul style="list-style-type: none"> • Impact on other practitioners' work • Discharge delays - Patient flow issues
Lack of Managerial transparency	Communication between the management team and practitioners	The SNP could not see funding that the SNPs brought into the hospital (by meeting targets) being spent on the improvement of the stroke care pathway.	<ul style="list-style-type: none"> • Lack of regular meetings between practitioners and the management team. 	<ul style="list-style-type: none"> • Lack of trust in hospital management amongst practitioners • Working and motivation issues.
Resource management	Inefficient hospital resource allocation between patients.	Older Persons' Unit (OPU) patients were admitted to the ASU and consequently, there was no bed available for the stroke patient to be admitted.	Unknown	<ul style="list-style-type: none"> • Increase of practitioners' workload • Increase of practitioners' stress & anxiety • Relational issues (inter-professional conflicts) • Patient flow issues • Delay of medical assessment • Delay of decision-making
Handover mechanism	Handover mechanism for transferring patients' information was not efficient.	Practitioners were complaining about the time required to complete patients' documents	<ul style="list-style-type: none"> • Large number of documents • Different way of reporting data. • Different knowledge. 	<ul style="list-style-type: none"> • Delay of medical assessment • Increase of practitioner's stress and anxiety • Information inaccuracy • Re-work
Interpersonal issues Issues or differences that impacted the way that healthcare practitioners interact with each other				

Shared knowledge	Professional roles and boundaries were unclear for some practitioners.	Some of the ED practitioners and radiologists were not aware of the SNP role. Different practitioners understood stroke care process in different ways.	<ul style="list-style-type: none"> • Unstructured language • Different incompatible protocols between departments 	<ul style="list-style-type: none"> • Impact on the work of other practitioners • Communication issues – frequency, timeliness • Delay of medical assessment
Different professional goals & objectives	Practitioners shared different professional and departmental goals and objectives.	The SNP focused on stroke care and meeting governmental targets while the RD had more and different governmental targets for wider patient groups.	<ul style="list-style-type: none"> • Different practitioner roles • Different medical interests • Different professional experiences • Different individual values • Different professional identity 	<ul style="list-style-type: none"> • Relational issues (inter-professional conflicts) • Decision-making accuracy • Patients' care
Different understandings of quality issues	Practitioners had different opinions regarding the existence and the causal factors relating to quality issues.		<ul style="list-style-type: none"> • Different professional experiences. • Limited communication between practitioners 	<ul style="list-style-type: none"> • Lack of improvement efforts
Trust	Lack of trust between the practitioners.	The SNP felt that once ED staff see an SNP involved with patient assessment, they do not complete their own tasks properly. Consequently, the SNP decided not to assess the patient immediately.	Unknown	<ul style="list-style-type: none"> • Communication frequency • Delay of medical assessment • Delay of decision-making
Mutual respect	Practitioners working within sub-groups within the same department blamed other sub-groups for issues arising within the care process.	The SNP felt that the stroke team did not support her by making a bed available for the patient.	Unknown	<ul style="list-style-type: none"> • Lack of trust • Communication frequency
Mutual support	Mutual support between care sub-groups within the ASU is insufficient	The stroke nurse could not help the SNP in moving the patient immediately to the ASU since she was administering care to other patients on	Unknown	<ul style="list-style-type: none"> • Increase of practitioners' stress and anxiety

		the ward and could not arrange a bed for the patient immediately.		<ul style="list-style-type: none"> • Relational issues (inter-professional conflicts) • Lack of trust
Issues outside the organisational routine Any factor that impacts care practice but, it is outside the stroke care pathway				
Patients' Discharge	The discharge of other stroke in-patients was delayed causing issues to the admission of the new patients	Patient was waiting for a place in social care and could not move out the same day/ the transport of the patient was delayed, therefore the stroke patient remained in the ED until the bed was available.	<ul style="list-style-type: none"> • Unavailability of specialist staff • Unavailability of space in social services • Transport issues 	<ul style="list-style-type: none"> • Bed shortage • Process delay • Increase of departmental workload
Environmental Socio-political factors				
Governmental targets	Hospital theme for improvement and priority differs from the stroke - QI for sepsis being first on the list for QI of the hospital's agenda	When a sepsis or trauma patient arrives focus among ED staff turns to that patient leaving the stroke patient behind	Unknown	<ul style="list-style-type: none"> • Different professional goals and targets • Prevent freedom in practice of care • effect on the patients

Table 7.7.3: Coding Scheme Used for the analysis of the data

D. Discussion

Pathway artefacts (Pictures)

(A)

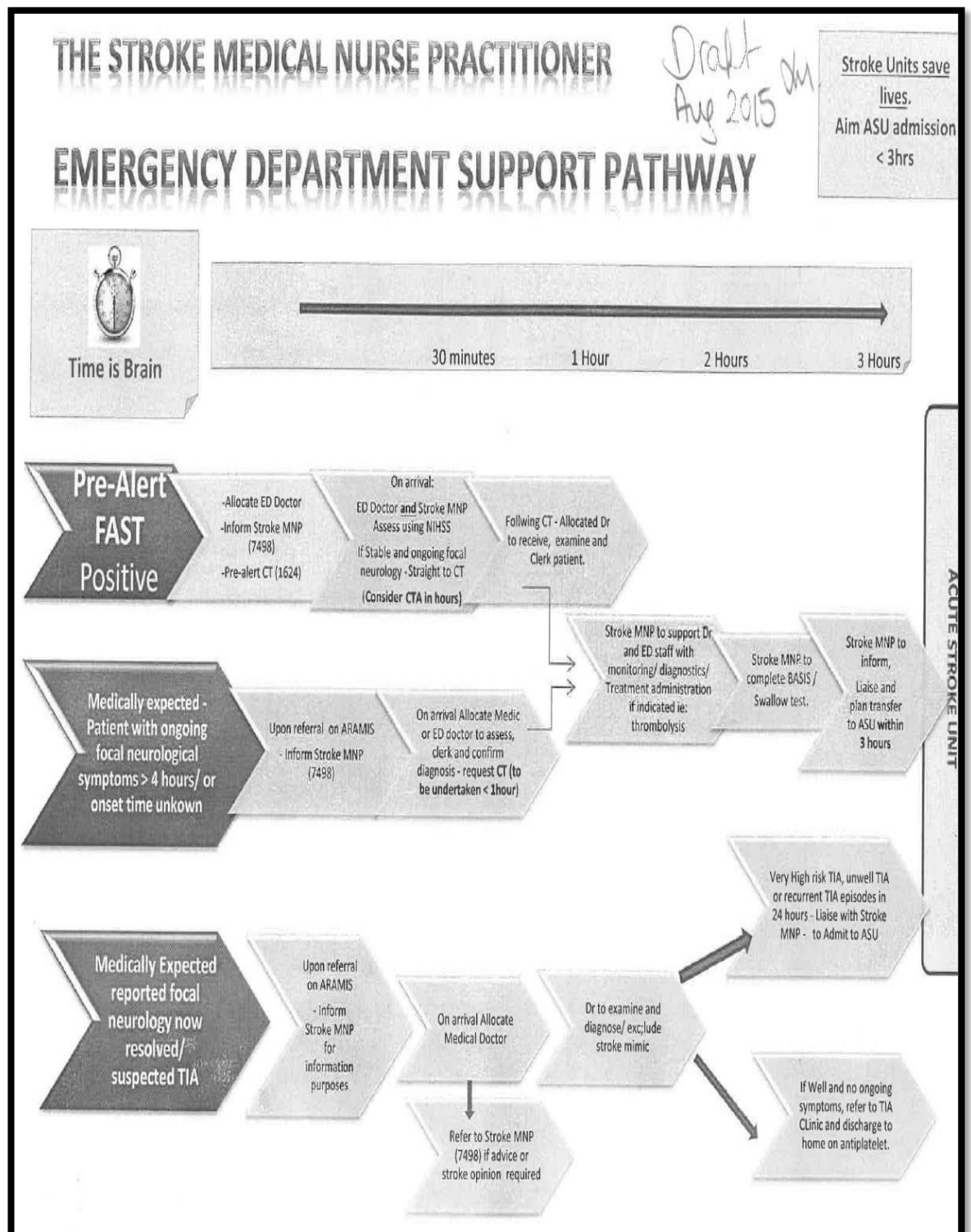


Figure 7.3: Diagram created by SNP, October 2015

(B)

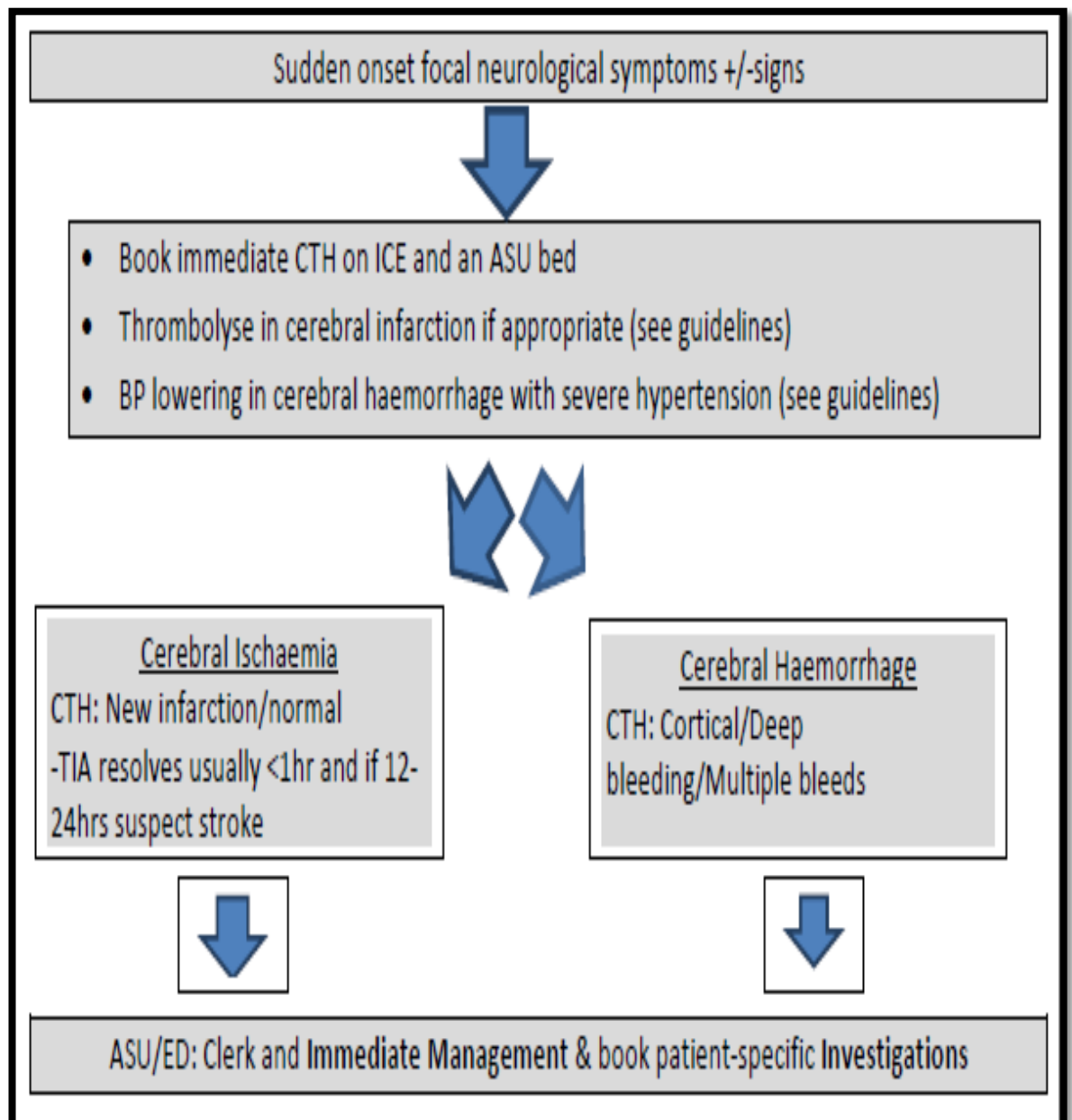


Figure 7.4: Diagram created by ED senior doctor, December 2015

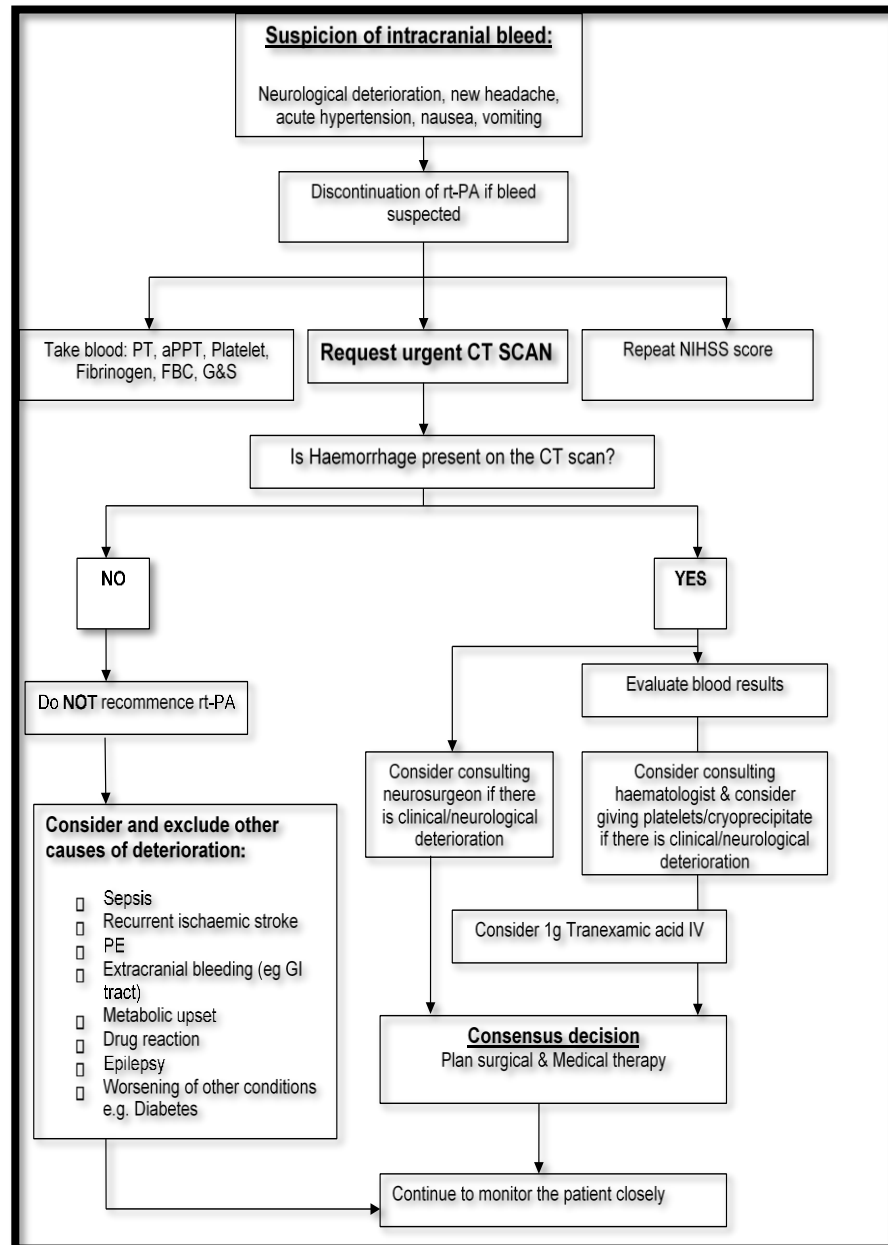


Figure 7.5: Diagram created by ASU team 2013 and reviewed 2016

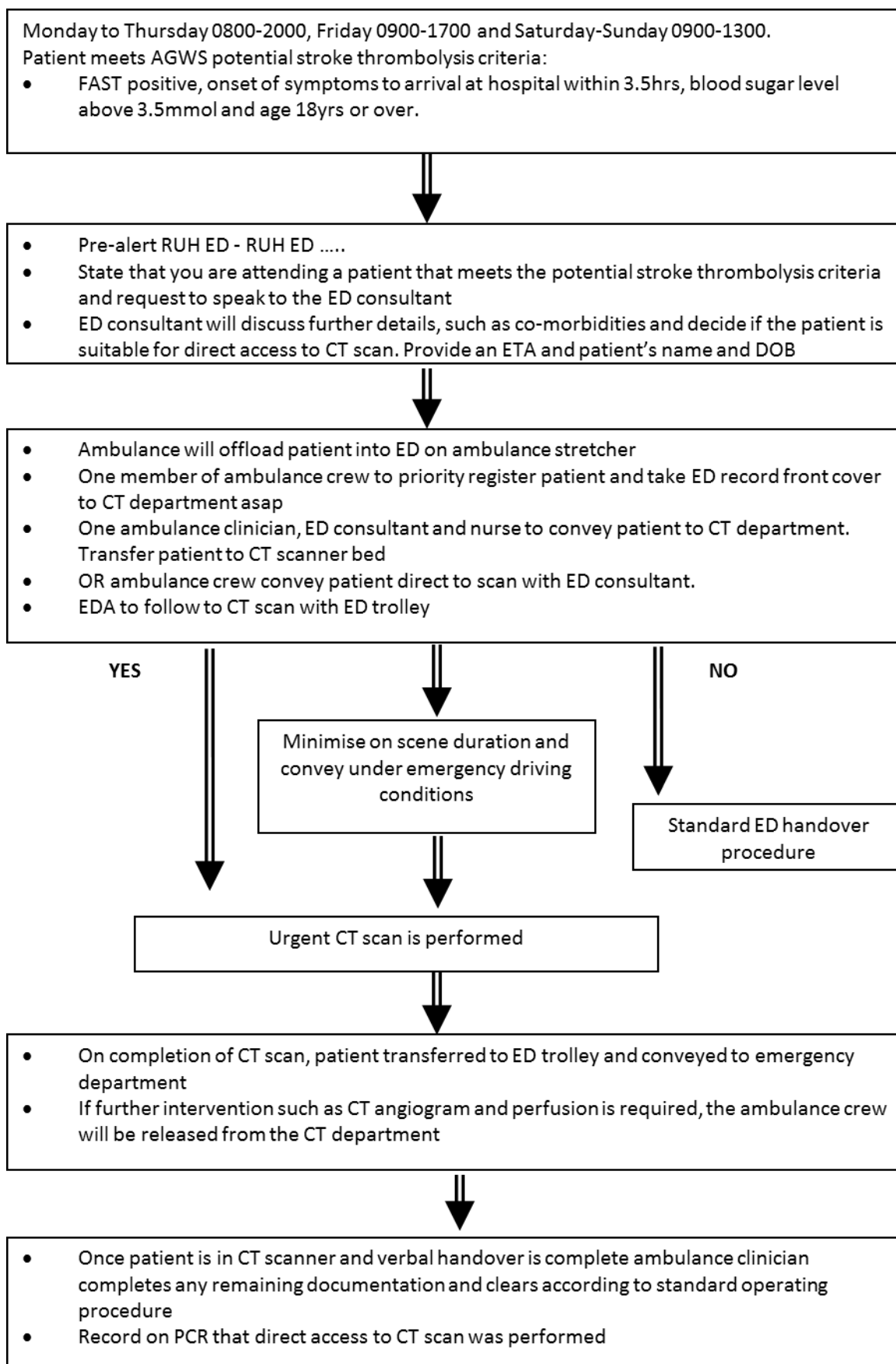


Figure 7.6: Diagram (followed by text) and text created by ED and ASU team and introduced to the RD staff to follow, December 2015

“The GWAS clinician contacts RUH ED consultant via the RUH pre-alert phone. Clinician provides a stroke pre-alert, patient’s name and date of birth (DOB) and an estimated time of arrival (ETA). The RUH ED consultant will obtain the information necessary to decide whether the patient is eligible for direct access to CT scan. If direct access to CT scan is confirmed, the ED consultant will pre-alert the CT department and provide ETA of patient and patient’s name and DOB if possible. The ED consultant will alert the stroke unit. The ED consultant will also notify the RUH ED reception office to enable priority patient registration and inform the nurse in charge of patient’s ETA to ensure the crew is expected. The ambulance crew will offload the patient on the ambulance stretcher and proceed through the ambulance entrance into the ED. The ED consultant and nurse will meet the GWAS ambulance on arrival at the ED majors desk. Option one: The crew will accompany the ED consultant to CT scan. An EDA will follow into CT with an ED trolley. Option two: One member of the ambulance crew will remain in the ED for priority registration. The remaining ambulance clinician, with the assistance of the ED consultant and nurse, will convey the patient to the CT scan. Once the patient has been registered, the ambulance clinician will be provided with the hospital clinical record front sheet. On receipt the ambulance clinician will deliver the form to the ED consultant in the CT department. This will enable the CT scan to be authorised and undertaken. An EDA will follow into CT with an ED trolley. Once the patient has been transferred into the CT scanner the ambulance crew can complete verbal handover if this has not been done and will complete any outstanding documentation and clear according to standard operating procedures. Ambulance clinician to ensure ‘direct to CT scan’ is recorded on GWAS patient care record”

The proposal is that all identified stroke patients that require a head CT scan are scanned where possible before arriving on the stroke unit. The easiest way to achieve this is for the scan to be part of the patient transfer, ie, as the patient is on their way from A/E to the Stroke Unit, they pass the CT unit and should divert into the unit for their CT head scan. The vast majority of patients could be scanned with very little delay and have a CT head scan available by the time they reach the Stroke Unit. The exception will be patients requiring scans between the hours of 8pm and 8am who will be accommodated first thing in the morning. The pathways would be as follows

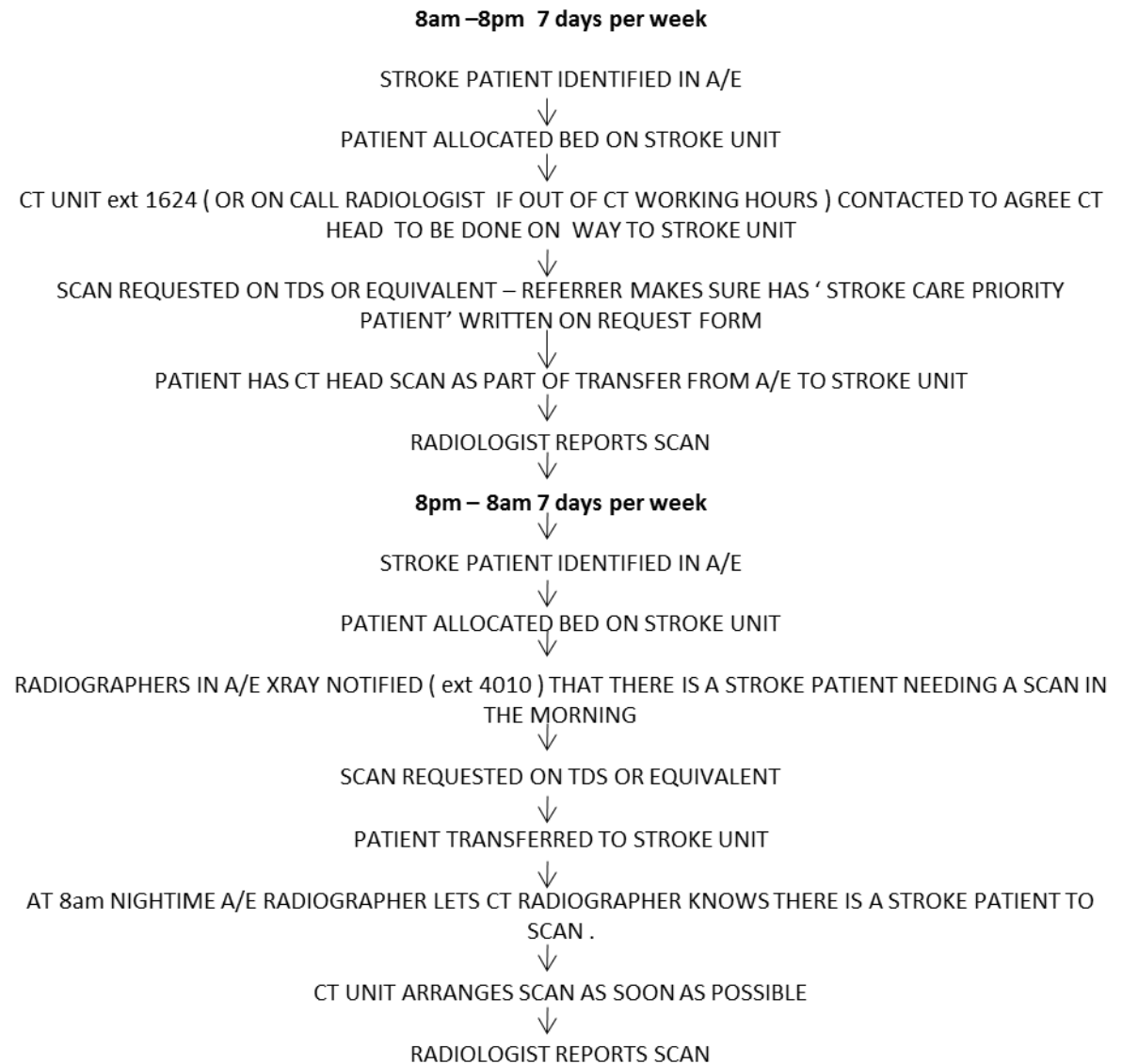


Figure 7.7: Diagram created by RD staff set to the ED for approval, but never approved, 2011

STROKE

- All ?strokes, ie patients with a stroke history AND an objective neurological deficit should have a CT immediately up to midnight.
- From midnight to 08:00 only potential thrombolysis patients, ?stroke patients with decreased GCS, severe hypertension, severe headache and vomiting should have a CT head. All others should wait till 08:00. If a patient does not fit these criteria and a CT head is required a consultant must make the referral themselves.
- Normal head CT with obvious clinical signs of stroke DOES NOT need a head MRI.
- Normal head CT with equivocal clinical signs of stroke should be referred for a head MRI only after they have been seen by the stroke team. This must be requested by a ST3 and above.
- Haemorrhage on CT with clinical signs of stroke DOES NOT need an immediate MRI Head. An interval head MRI in 6-8 weeks is advised to allow the blooming artefact from haemorrhage to diminish.
- If patients clinical symptoms progress consider MRI. Referral required from a stroke consultant.

Figure 7.8: Diagram created by SNP and ED doctor, 2015

Availability of Direct-to-CT: 08:00 – 20:00 Mon – Thu 08:00 – 17:00 Fri 08:00 – 13:00 WE & BH	Out of hours but before 21:00: ring on call Radiologist via Switchboard 21:00 to 08:00: liaise with ED Radiographers
<p style="text-align: center;">Straight to CT?</p> <p style="text-align: center;">No Yes</p> <ol style="list-style-type: none"> IN HOURS: call CT on x 1624 giving patient name, dob, hospital number and ETA OUT OF HOURS: liaise with on-call radiologist/ED radiographers as detailed above Inform Stroke MNP on 7498 Inform shift-coordinator, High Care staff & receptionist Paramedics to take patient straight to CT with ED Doctor escort & thrombolysis pack, EDA to follow with Cas-card and trolley Consider CTA for patients presenting within NBT thrombectomy hours 	

Figure 7.9: Diagram created by ED staff 2014

Aim: The aim of these guidelines is to ensure that patients receive the correct examination in a timely manner and that MRI & CT resources are used appropriately.

TIA

Patients who have no focal neurology may have a TIA MRI Protocol with an immediate report once they have been seen by the stroke service. For patients who have been seen in TIA clinic on a Mon –Fri the following process should be applied.

- Referral process, ring ext 1612 (MRI 2 scanner) to check if slots are available and if so, provide patient details and complete ICE referral.
- The patients will have a full head MRI protocol including a T2 GE sequence allowing us to scan a max of 2 patients.
- If there are more patients referred, they may need to have a CT scan instead or be fitted in later in the afternoon.
- This arrangement is for Mon-Fri, existing arrangements for occasional MRI at weekends already exist.
- In the event of emergencies or equipment breakdown, CT may need to be performed instead or an MRI later in the day.
- Patients referred must all be safe for MRI and be able to co-operate with an MRI scanner.
- If patients have not been referred by 11.30, the appointment slot will be used for an inpatient.

STROKE

- All strokes, ie patients with a stroke history AND an objective neurological deficit should have a CT immediately up to midnight.
- From midnight to 08:00 only potential thrombolysis patients, ?stroke patients with decreased GCS, severe hypertension, severe headache and vomiting should have a CT head. All others should wait till 08:00. If a patient does not fit these criteria and a CT head is required a consultant must make the referral themselves.
- Normal head CT with obvious clinical signs of stroke **DOES NOT** need a head MRI.
- Normal head CT with equivocal clinical signs of stroke should be referred for a head MRI only after they have been seen by the stroke team. This must be requested by a ST3 and above.
- Haemorrhage on CT with clinical signs of stroke **DOES NOT** need an immediate MRI Head. An interval head MRI in 6-8 weeks is advised to allow the blooming artefact from haemorrhage to diminish.
- If patients clinical symptoms progress consider MRI. Referral required from a stroke consultant.

VENOUS SINUS THROMBOSIS

- MRV is currently our investigation of choice (this will become CTV once we have a new CT scanner)
- Headache with normal CT and normal LP opening pressure do not need an MRI

MRV will be carried out 08:00 to 20:00. Outside these times the patient will be empirically treated or will wait for the scan (including pregnant patients) unless they have focal neurological signs. They will then either have CTV or MRV depending upon staff availability and expertise

Figure.7.110: Acute & in-patient MRI head referral guideline